GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Analytics of Raw and Construction Materials, PG_00048917		
Field of study	Chemistry in Construction Engineering		
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	5	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Błażej Kudłak	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	15.0	75

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	75	5.0	70.0	150

Subject objectives

Participants of the classes should learn the basic building materials, raw materials, additives, contaminants, wastes. They will apply knowledge of the chemical properties of construction materials to propose analytical procedure for the control of building materials, final products, wastes. Student will know validation protocol. The key analytical techniques used in analysis of building materials and products must be described.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_K03	Having finished the course the student knows how to evaluate risk of actions undertaken by engineer, knows how to solve problems connected with this work, is able to gain knowledge in this area and present it to his/her coworkers, is able to communicate and give/accept criticism in a constructive manner	[SK2] Assessment of progress of work [SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness [SK3] Assessment of ability to organize work
K6_U09	Having finished the course the student knows how to present his/her knowledge on given properties of construction materials and descibe processes that should be performed to modify them.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
K6_W08	Student has deepened knowledge on analytial methods in relation to their usage in analytics of resources and construction materials, analyzing corrosion damages, environmental pollution; is able to perform measurements of selected properties of construction materials and knows mathematical and IT techniques indispensible in this process.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>LECTURE Overview lecture Technical analysis in the industry and its scope. Construction materials, raw materials, additives, contaminants, wastes. Types of building materials, their characteristics and chemical properties. Analytical control of raw materials, auxiliary materials, final products, waste materials. Organization of analytic control. Sampling and preparation of a representative sample, and possible sources of error. Evaluation of the validity of the results. Documentation of the analytical laboratory. The analytical methods used in analysis of raw materials and construction products. Spectroscopic analysis. Mass spectrometry. Chromatographic techniques. Speciation. X-ray fluorescence. Polymers for construction chemicals. Analysis of the main component and impurities. Analysis of the air. Analysis of the water. Analysis of the fuel. Analysis of the lubricants. Analysis of steel. Analysis of aggregate, cement and other building materials. Analysis of the wood. Analysis of the glass. Analysis of the asphalt. Analysis of the paints and varnishes. Nanotechnology - an innovative building chemistry. Building Materials in accordance with sustainable development. Ecological solutions. TUTORIALS LABORATORY 1. Quantitative determination of PAH concentrations in mixtures of tar substances emitted during the thermal plasticization of bitumen 2. Analysis of dyes in polymeric materials. 3. Analysis of metal content in cement (white and gray). 4. Analysis of compounds emitted into indoor air: passive dosimetry and dynamic techniques. 5. Determine the type of polymer on the basis of its solubility. 6. Identification and quantitative analysis of the preservative (permetrynu) applied to wood by HPLC. 7. Study the contents of CaO and MgO, CO2 and moisture in the lime (hydrated, slaked) 8. Determination of residual solvents in the wastewater. 9. A trip to the cement, "Cement Wejherowo" Ltd. , Manufacturer of white portland cement. PROJECT SEMINAR 1. The chemical composition of gypsum plaster and newly located and the old. 2. Polymeric materials in water and their impact on the quality of water supplied. 3. Influence of physico-chemical factors on the formation of sustainable and effective waterproofing materials. 4. Bitumen and bitumen in the coatings solvents papowych. 5. Industrial flooring. 6. Binders lime and limestone products in the binder. The role of hydrated lime. 7. Dyes for polymeric materials. 8. Biocides to protect wood. 9. Benefits for humans and the environment arising from the use of steel in construction. 10. Environmental aspects in the design of glass facades 11. The future of concrete in terms of sustainable development. 12. Indoor air pollution in various indoor areas. 13. Passive and dynamic methods used to analyze the volatile pollutants indoors. 14. Chemical analysis of effluent from a cement plant. 15. Air and water pollution (surface and groundwater) emitted as a result of LOTOS in Gdansk. Waste management.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of analytical, inorganic and organic chemistry.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
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<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Seminar: Everage grade from 3 tests</td><td>60.0%</td><td>15.0%</td></tr>
<tr><td>Labs: everage grade from tests and reports</td><td>60.0%</td><td>15.0%</td></tr>
<tr><td>Written exam</td><td>60.0%</td><td>70.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Minczewski J., Marczenko Z.: Chemia analityczna. Podstawy teoretyczne i analiza jakościowa, t. I, Wyd. 8, PWN 2001 Minczewski J., Marczenko Z.: Chemia analityczna. Chemiczne metody analizy, t. II, Wyd.9, PWN 2001 Cygański A.: Chemiczne metody analizy ilościowej, Wyd 5 rozsz., WNT, 1999 Görlich E.: Analiza krzemianów, Wyd. Geologiczne, W-wa 1958 Hulanicki A.: Współczesna chemia analityczna, WNPWN, Warszawa 2001 Namieśnik J, : Przygotowanie próbek środowiskowych do analiz., Wyd. WNT, 2000

lectures delivered in the electronic form</td></tr>
<tr><td>Supplementary literature</td><td>Periodic: "Materiały budowlane" praca zbiorowa pod kier.: prof. dr hab. inż. Bogusława Stefańczyka - Budownictwo ogólne,tom 1,Materiały i wyroby budowlane. Wyd. ARKADY, Warszawa 2005; Małolepszy J., "Materiały budowlane. Podstawy technologii i metody badań (wyd.2 zmienione i poprawione). Publ. AGH ISBN: 9788374641395</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>see above</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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