GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemistry, PG_00037262		
Field of study	Technical Physics		
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 Subject group related to scientific research 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	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department Of Chemistry And Technology Of Functional Materials -> Faculty Of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Ewa Wagner-Wysiecka	
	Teachers	dr hab. inż. Ewa Wagner-Wysiecka dr hab. inż. Andrzej Nowak dr inż. Mariusz Szkoda dr inż. Konrad Trzciński prof. dr hab. Anna Lisowska-Oleksiak	

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	0.0	60
	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	60	5.0	35.0	100

Subject objectives	The main goal of the course is to consolidate knowledge of students in general chemistry.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] plans and conduct experiments, critically analyzes their results, draw conclusions and forms opinions, has laboratory work experience	The student has experience in working in a chemical laboratory	[SU4] Assessment of ability to use methods and tools
[K6_W01] understands the importance of physics and its applications in connection to civilization	The student is able to integrate knowledge from physics and chemistry and understands their combined role in the advancement of science, technology, and the modern world.	[SW1] Assessment of factual knowledge

Subject contents	Periodic table of elements. Electron configurations of atoms. Periodic changes of some quantities: ionization energy of elements, electron affinity, electronegativity of elements. Atomic and ionic radius. Basic chemical laws, formulas and chemical equations. Chemical bonds: main types of bonds. Covalent bond: description of electrons in molecules considered on the basis of the electronic theory of chemical bonding and the theory of molecular orbital. Binding and anti-bonding orbitals. The shapes of the molecular orbital regions: molecular and type orbitals. The concept of orbitals hybridization. Explanation of the shape of molecules based on the concept of hybridization. Delocalized bonds. Aromatic compounds: properties, examples. Explanation of the shape of molecules - VSEPR method. Polarization of chemical bonding. Intermolecular interactions. Hydrogen bonding and its effect on the physical properties of chemical compounds. General characteristics of the states of matter. Solid: crystallographic systems, elementary cell types, ionic, covalent, molecular and metallic crystals. The crystal structure and the physical properties of the substance. Types of chemical reactions. Nomenclature of inorganic compounds. Properties of particular groups of inorganic compounds. Coordination binding. Complex compounds: the concept of a central atom and ligand, examples of complex compounds and their names, properties of complex compounds and their importance. Organic compounds: classification, nomenclature, isomerism, properties, reactivity. Polymers synthesis, properties, examples. Biologically important macromolecules: proteins and nucleic acids. Chemical thermodynamics - basic concepts, the first principle. Enthalpy of physical changes and chemical reactions. The second law of thermodynamics: entropy, free enthalpy, free enthalpy of reaction, spontaneous processes, reactions in a state of equilibrium. Solutions, types of solutions. Chemical equilibrium. Equilibria in aqueous solutions. Electrolyte solutions. Ion and proton theory of acids and bases. The concept of pH. Low electrolytes. Hydrolysis. Ostwald's dilution law. Buffer solutions. Electronic theory of acids and bases, HSAB theory. Strong electrolytes, the concept of ionic activity and strength. Chemical kinetics. Effect of concentrations of reacting substances on the reaction rate. The influence of temperature. The role of the catalyst. Chemical qualitative and quantitative analysis. Oxidation and reduction reactions. Oxidation state. Cell. Electrode potential. The Nernst equation. Half-cells. Definition of relative electrode potential. Half-cell of the first type. Electrochemical series of metals. Half-cell of the second type. Redox half-cell. Electrolysis. Corrosion.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Passing the lecture - written colloquium	50.0%	50.0%
Passing laboratory exercises	50.0%	50.0%

Recommended reading	Basic literature	1. L. Jones, P. Atkins Chemia ogólna. Czasteczki, materia, reakcje" PWN 2009. 2. A. Bielański Podstawy chemii nieorganicznej PWN 2002. 3. F.A. Cotton, G. Wilkinson, P.L. Gaus Chemia nieorganiczna. Podstawy PWN 2002. 4. P.W. Atkins Podstawy chemii fizycznej PWN 1999. 5. J. McMurry Chemia organiczna PWN 2005. 6. E. Luboch, M. Bocheńska, J.F. Biernat (red.) Chemia ogólna. Ćwiczenia laboratoryjne, Wyd. PG 2003.
	Supplementary literature	1. W. Kołos, J. Sadlej Atom i cząsteczka WNT 2007. 2. P.W. Atkins Przewodnik po chemii fizycznej PWN 1997. 3. A. Cygański Metody elektroanalityczne WNT 1995.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	How do the properties of the main group elements change as their atomic weight increases?Concepts of chemical bonding: ionic bonding, covalent bonding.Properties of ionic substances.The pH scale. Importance of pH in nature and economy.How does the rate of a chemical reaction depend on temperature? Give the relevant mathematical relationships (van't Hoff's rule, Arrhenius equation).	
Work placement	Not applicable	

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