



## Subject card

Subject name and code	Applied Chemistry and Ecology, PG_00053191						
Field of study	Engineering Management						
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 Subject group related to scientific research 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			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Quality Management and Commodity Science -> Faculty of Management and Economics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Maria Szpakowska					
	Teachers	dr inż. Ewa Marjańska mgr Anna Wendt prof. dr hab. inż. Maria Szpakowska					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	16.0	16.0	0.0	0.0	0.0	32
	E-learning hours included: 0.0						
Chemia Stosowana i Ekologia Studia Niestacjonarne 2022/23 - Moodle ID: 25284 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25284">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25284</a>							
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	32	8.0	60.0	100		
Subject objectives	To familiarize students with basic chemical compounds and their application and the acquisition of chemical calculation skills. Application of basic chemical calculations to solve ecological problems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W11] has the basic knowledge of mathematics, physics and chemistry necessary to solve technical problems	Solves simple chemical tasks related to the construction of matter and the existence of chemical compounds in nature.			[SW1] Assessment of factual knowledge		
	[K6_W08] has a basic knowledge of the changes taking place in the organisation and its environment, taking into account environmental problems	Understands the basic processes occurring in the environment.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_K02] identifies problems related to undertaking various tasks, including engineering in the changing conditions of the organisation's functioning; takes into account the ethical aspect related to the implementation of the organisation's tasks	Defines basic chemical compounds and determines their applications.			[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice		
	[K6_K04] is aware of the importance of the non-technical impacts of engineering activities, including environmental impacts	Knows the basics of environmental management according to ISO 14000.			[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice		
	[K6_U01] interprets and analyses the phenomena and processes taking place in the economy and organisation using basic theoretical knowledge of economics, management and science	Understands the concept of sustainable development.			[SU1] Assessment of task fulfilment		

Subject contents	<p>LECTURE</p> <p>General concepts and model of environmental contamination as well as chemical laws and structure of matter</p> <p>Periodic table and the structure of elements</p> <p>Molecule structure, ionization energy, electronic affinity, electronegativity</p> <p>Atomic, ionic, hydrogen and coordination bonds</p> <p>The state of gas, excellent gases, technical, fuel, gases in the air</p> <p>Sources of air pollution, smog, greenhouse effect, ozone hole, radioactive contamination</p> <p>Liquid state, physical and chemical properties of water, water hardness, natural water and sewage, wastewater treatment, solutions, concentration and solubility</p> <p>Glassy state, glass</p> <p>Solid state, crystals and their types,</p> <p>Types of chemical compounds, oxides, bases, acids, salts</p> <p>Chemical reactions, water dissociation, neutralization reactions, redox reactions</p> <p>Chemical kinetics</p> <p>Electrochemistry, electrolysis, voltage series, galvanic cells</p> <p>Metals, classification, minerals, precious stones, metal alloys, corrosion</p> <p>Silicon and silica applications</p> <p>Chemistry of coal, hydrocarbons, alcohols and phenols, ethers, aldehydes and ketones, organic acids, esters, soaps and detergents</p> <p>Chemical compounds and waste, waste classification, recycling, composting, biogas, incineration, storage</p> <p>Organic, municipal, industrial, energy, hazardous waste</p> <p>Soil contamination</p> <p>EXERCISES</p> <p>Introduction. Rules for passing the subject</p> <p>Construction of the periodic table of elements. Total patterns. Periodicity law. Valence. Constitution law. Chemical equations. Patterns of two-component elements of main groups (oxides, hydrides). Atomic number and mass number. Isotopes.</p> <p>Basics of chemical calculations</p> <p>Molar mass. Molecular weight. Molecular interpretation of chemical transformations. Stoichiometric ratios in chemical transformations. Avogadro's law. Examples and techniques of chemical calculations.</p> <p>Rapid reaction and chemical equilibrium</p> <p>The concept of the speed of a chemical reaction. Factors influencing the speed of chemical reactions.</p> <p>Constant chemical equilibrium. The law of the masses. The rule of outrage. The influence of pressure, temperature on the equilibrium constant. Examples of calculations.</p> <p>Saturated, unsaturated and supersaturated solutions. Energy effects accompanying dissolution processes.</p> <p>Methods for expressing concentration of solutions. Dilutions and conversion of concentrations.</p> <p>Reactions in aqueous solutions</p> <p>Water dissociation. PH scale. Determination of pH of solutions. Dissociation.</p> <p>Properties of inorganic compounds</p> <p>Division of inorganic compounds. Construction and nomenclature. Basic reactions.</p> <p>Galvanic cells</p> <p>Half-cells and their types. Half-cell potential. Electromotive force. A series of voltage. Galvanic cells as a power source. Calculations.</p> <p>Electrolysis</p> <p>Electrolyser construction. Faraday's Law. Faraday's standing. Practical applications of electrolysis - tasks. Redox reactions. Corrosion of metals and methods of its eradication. Works.</p> <p>Written test from part 1 - 5 tasks.</p> <p>Holdgate Model - tasks</p> <p>Waste classification in the light of the Waste Act 2001, including novellas</p> <p>Analysis of the waste catalog</p> <p>Environmental management in the light of ISO 14000</p>														
Prerequisites and co-requisites	Basics of mathematics and physics														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1619 794 1653">Subject passing criteria</th> <th data-bbox="799 1619 1137 1653">Passing threshold</th> <th data-bbox="1142 1619 1481 1653">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1653 794 1686">lecture colloquium</td> <td data-bbox="799 1653 1137 1686">60.0%</td> <td data-bbox="1142 1653 1481 1686">40.0%</td> </tr> <tr> <td data-bbox="456 1686 794 1720">exercises colloquium</td> <td data-bbox="799 1686 1137 1720">60.0%</td> <td data-bbox="1142 1686 1481 1720">35.0%</td> </tr> <tr> <td data-bbox="456 1720 794 1751">exercises reports</td> <td data-bbox="799 1720 1137 1751">60.0%</td> <td data-bbox="1142 1720 1481 1751">25.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	lecture colloquium	60.0%	40.0%	exercises colloquium	60.0%	35.0%	exercises reports	60.0%	25.0%
Subject passing criteria	Passing threshold	Percentage of the final grade													
lecture colloquium	60.0%	40.0%													
exercises colloquium	60.0%	35.0%													
exercises reports	60.0%	25.0%													

Recommended reading	Basic literature	<p>J. Sienko, R.A.Plane, <i>Chemia, Podstawy i zastosowania</i>, WNT, Warszawa, 1979;</p> <p>K.M. Pazdro, <i>CHEMIA dla kandydatów na wyższe uczelnie</i>, PWN, Warszawa, 1985;</p> <p>L. Pauling, P.Pauling, <i>Chemia</i>, PWN, Warszawa, 1983;</p> <p>J. Kroschwitz, M. Winokur, <i>Chemistry, A first course</i>, McGraw-Hill Book Company, 1980, 2005;</p> <p>F. A. Cotton, G. Wilkinson, P.L.Gaus, <i>Chemia nieorganiczna</i>, Warszawa, PWN, 1995;</p> <p>J. E. Andrews, P. Brimblecombe, T.D. Jickells, P.S. Liss, <i>Wprowadzenie do chemii środowiska</i>, WNT, Warszawa 2000;</p> <p>S. F. Zakrzewski, <i>Podstawy toksykologii środowiska</i>, WN PWN, Warszawa 2000;</p> <p>C. Rosik-Dulewska, <i>Podstawy gospodarki odpadami</i>, WN PWN, Warszawa 2000;</p> <p>M. Popkiewicz, <i>Świat na rozdrożu</i>, Wydawnictwo Sonia Draga, Katowice, 2012;</p> <p>M. Popkiewicz, <i>Rewolucja energetyczna, Ale po co?</i> Wydawnictwo Sonia Draga, Katowice, 2016;</p> <p>J. Datta, P. Jutrzenka Trzebiatowska, P. Kasprzyk <i>Wybrane zagadnienia recyklingu tworzyw sztucznych i gumy</i>, Wydawnictwo PG, Gdańsk 2018;</p> <p>J. Taubman, <i>Węgiel i alternatywne źródła energii, Prognozy na przyszłość</i>, PWN, Warszawa, 2011;</p> <p>D. Yergin, <i>The Quest, W poszukiwaniu energii</i>, Publishing Kurhaus Media, 2013.</p>
	Supplementary literature	Mary K. T., Louis T., <i>Introduction to Environmental Management</i> , CRC Press, 2009
	eResources addresses	

<p>Example issues/ example questions/ tasks being completed</p>	<p>Application of selected chemical compounds of solid, liquid and gaseous state.</p> <p>Types of bonds in liquids. Physical and chemical properties of water and other solvents.</p> <p>Description of application of selected acids, aldehydes, ketones, alcohols and organic compounds.</p> <p>Application of technical and fuel gases.</p> <p>Calculations of concentration of solutions' components. Calculation of EMF and quantity of cells necessary for adequate voltage gain.</p> <p>Environmental contamination model</p> <p>ISO 14000</p> <p>Classification of waste and harmful substances pn the basis of regulations</p>
<p>Work placement</p>	<p>Not applicable</p>