



## Subject card

Subject name and code	Applied Chemistry and Ecology, PG_00053190						
Field of study	Engineering Management						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2020/2021		
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			e-learning		
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	prof. dr hab. inż. Maria Szpakowska dr inż. Ewa Marjańska mgr Anna Wendt					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 60.0 Adresy na platformie eNauczanie: Chemia Stosowana i Ekologia Studia Stacjonarne 2020/21 - Moodle ID: 1811 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=1811">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=1811</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	60		8.0		32.0	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_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	Understands the concept of sustainable development.	[SK1] Assessment of group work skills
	[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_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_W11] has the basic knowledge of mathematics, physics and chemistry necessary to solve technical problems	Defines basic chemical compounds and their application in the environment.	[SW1] Assessment of factual knowledge
	[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	Solves simple chemical tasks related to structure of matter and the existence of chemical compounds in nature.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [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  Periodic table and the structure of elements  Molecule structure, ionization energy, electronic affinity, electronegativity  Atomic, ionic, hydrogen and coordination bonds  The state of gas, excellent gases, technical, fuel, gases in the air  Sources of air pollution, smog, greenhouse effect, ozone hole, radioactive contamination  Liquid state, physical and chemical properties of water, water hardness, natural water and sewage, wastewater treatment, solutions, concentration and solubility  Glassy state, glass  Solid state, crystals and their types,  Types of chemical compounds, oxides, bases, acids, salts  Chemical reactions, water dissociation, neutralization reactions, redox reactions  Chemical kinetics  Electrochemistry, electrolysis, voltage series, galvanic cells  Metals, classification, minerals, precious stones, metal alloys, corrosion  Silicon and silica applications  Chemistry of coal, hydrocarbons, alcohols and phenols, ethers, aldehydes and ketones, organic acids, esters, soaps and detergents  Chemical compounds and waste, waste classification, recycling, composting, biogas, incineration, storage  Organic, municipal, industrial, energy, hazardous waste  Soil contamination</p> <p>Exercises</p> <p>Introduction. Rules for passing the subject  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.  Basics of chemical calculations  Molar mass. Molecular weight. Molecular interpretation of chemical transformations. Stoichiometric ratios in chemical transformations. Avogadro's law. Examples and techniques of chemical calculations.  Rapid reaction and chemical equilibrium  The concept of the speed of a chemical reaction. Factors influencing the speed of chemical reactions.  Constant chemical equilibrium. The law of the masses. The rule of outrage. The influence of pressure, temperature on the equilibrium constant. Examples of calculations.  Saturated, unsaturated and supersaturated solutions. Energy effects accompanying dissolution processes. Methods for expressing concentration of solutions. Dilutions and conversion of concentrations.  Reactions in aqueous solutions  Water dissociation. PH scale. Determination of pH of solutions. Dissociation.  Properties of inorganic compounds  Division of inorganic compounds. Construction and nomenclature. Basic reactions.  Galvanic cells  Half-cells and their types. Half-cell potential. Electromotive force. A series of voltage. Galvanic cells as a power source. Calculations.  Electrolysis  Electrolyser construction. Faraday's Law. Faraday's standing. Practical applications of electrolysis - tasks.  Redox reactions. Corrosion of metals and methods of its eradication. Works.  Written test from part 1 - 5 tasks.  Holdgate Model - tasks  Waste classification in the light of the Waste Act 2001, including novellas  Analysis of the waste catalog  Environmental management in the light of ISO 14000</p>														
Prerequisites and co-requisites	Fundamentals 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">Test In exercises</td> <td data-bbox="799 1653 1137 1686">60.0%</td> <td data-bbox="1142 1653 1481 1686">35.0%</td> </tr> <tr> <td data-bbox="456 1686 794 1720">Test In lectures</td> <td data-bbox="799 1686 1137 1720">60.0%</td> <td data-bbox="1142 1686 1481 1720">40.0%</td> </tr> <tr> <td data-bbox="456 1720 794 1751">Reports in exercises</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	Test In exercises	60.0%	35.0%	Test In lectures	60.0%	40.0%	Reports in exercises	60.0%	25.0%
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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	Chemia Stosowana i Ekologia Studia Stacjonarne 2020/21 - Moodle ID: 1811 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=1811">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=1811</a>

<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 ISO 14000 Classification of waste and harmful substances on the basis of regulations</p>
<p>Work placement</p>	<p>Not applicable</p>