GDAŃSK UNIVERSITY OF TECHNOLOGY

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 (on-line)	Mode of delivery	blended-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	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: 24.0						

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	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_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.	[SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills
[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
[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.	[SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills
[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

Subject contents	LECTURE 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 EXERCISES 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
Prerequisites and co-requisites	Basics of mathematics and physics
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
exercises colloquium	60.0%	35.0%
lecture colloquium	60.0%	40.0%
exercises reports	60.0%	25.0%

Recommended reading	Basic literature	J. Sienko, R.A.Plane, *Chemia, Podstawy i zastosowania*, WNT, Warszawa, 1979; K.M. Pazdro, *CHEMIA dla kandydatów na wyższe uczelnie*, PWN, Warszawa, 1985; L. Pauling, P.Pauling, *Chemia,* PWN, Warszawa, 1983; J. Kroschwitz, M. Winokur, Chemistry, A first course, McGraw-Hill Book Company, 1980, 2005; F. A. Cotton, G. Wilkinson, P.L.Gaus, Chemia nieorganiczna, Warszawa, PWN, 1995; J. E. Andrews, P. Brimblecombe, T.D. Jickells, P.S. Liss, Wprowadzenie do chemii środowiska, WNT, Warszawa 2000; S. F. Zakrzewski, Podstawy toksykologii środowiska, WN PWN, Warszawa 2000; C. Rosik-Dulewska, Podstawy gospodarki odpadami, WN PWN, Warszawa 2000; M. Popkiewicz, Świat na rozdrożu, Wydawnictwo Sonia Draga, Katowice, 2012; M. Popkiewicz, Rewolucja energetyczna, Ale po co? Wydawnictwo Sonia Draga, Katowice, 2016; J. Datta, P. Jutrzenka Trzebiatowska, P. Kasprzyk Wybrane zagadnienia recyclingu tworzyw sztucznych i gumy, Wydawnictwo PG, Gdańsk 2018; J. Taubman, Węgiel i alternatywne źródła energii, Prognozy na przyszłość, PWN, Warszawa, 2011; D. Yergin, The Quest, W poszukiwaniu energii, Publishing Kurhaus Media, 2013.
	Supplementary literature	Mary K. T., Louis T., Introduction to Environmental Management, CRC Press, 2009
	eResources addresses	Adresy na platformie eNauczanie: Chemia Stosowana i Ekologia Studia Niestacjonarne ONLINE 2022/23 - Moodle ID: 29643 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29643

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