



Subject card

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|---|--|---|--|-------------------------------------|---|--|-----|
| Subject name and code | Applied Chemistry and Ecology, PG_00053191 | | | | | | |
| Field of study | Engineering Management | | | | | | |
| Date of commencement of studies | October 2021 | Academic year of realisation of subject | | | | 2021/2022 | |
| 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 | 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 | | | | |
| 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 | | | | | | |
| 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_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_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_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_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_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 | <p>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</p> <p>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</p> | | | | | | | | | | | | | | |
|---------------------------------|---|-------------------------------|--|--------------------------|-------------------|-------------------------------|--------------------|-------|-------|-------------------|-------|-------|----------------------|-------|-------|
| Prerequisites and co-requisites | Basics of mathematics and physics | | | | | | | | | | | | | | |
| Assessment methods and criteria | <table border="1"> <thead> <tr> <th data-bbox="453 1070 794 1102">Subject passing criteria</th> <th data-bbox="798 1070 1139 1102">Passing threshold</th> <th data-bbox="1142 1070 1485 1102">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1106 794 1137">lecture colloquium</td> <td data-bbox="798 1106 1139 1137">60.0%</td> <td data-bbox="1142 1106 1485 1137">40.0%</td> </tr> <tr> <td data-bbox="453 1142 794 1173">exercises reports</td> <td data-bbox="798 1142 1139 1173">60.0%</td> <td data-bbox="1142 1142 1485 1173">25.0%</td> </tr> <tr> <td data-bbox="453 1178 794 1209">exercises colloquium</td> <td data-bbox="798 1178 1139 1209">60.0%</td> <td data-bbox="1142 1178 1485 1209">35.0%</td> </tr> </tbody> </table> | | | Subject passing criteria | Passing threshold | Percentage of the final grade | lecture colloquium | 60.0% | 40.0% | exercises reports | 60.0% | 25.0% | exercises colloquium | 60.0% | 35.0% |
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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 | |

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| <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> |