

| <b>STUDY MODULE DESCRIPTION FORM</b>   |  |   |
|--|--|---|
| Name of the module/subject<br><b>Environmental Chemistry</b>   |  | Code<br><b>1010101211010130914</b>  |
| Field of study<br><b>Environmental Engineering First-cycle Studies</b>   | Profile of study<br>(general academic, practical)<br><b>general academic</b> | Year /Semester<br><b>1 / 1</b>  |
| Elective path/specialty<br><b>-</b>  | Subject offered in:<br><b>Polish</b>   | Course (compulsory, elective)<br><b>obligatory</b>  |
| Cycle of study:<br><b>First-cycle studies</b>  | Form of study (full-time, part-time)<br><b>full-time</b>                     |   |
| No. of hours<br>Lecture: <b>30</b> Classes: <b>15</b> Laboratory: <b>-</b> Project/seminars: <b>-</b>  |  | No. of credits<br><b>5</b>  |
| Status of the course in the study program (Basic, major, other)<br><b>basic</b>  |  | (university-wide, from another field)<br><b>from field</b>  |
| Education areas and fields of science and art<br><b>technical sciences</b>   |  | ECTS distribution (number and %)<br><b>5 100%</b>   |
| <b>Responsible for subject / lecturer:</b><br>Izabela Kruszelnicka PhD<br>email: e-mail: izabela.kruszelnicka@put.poznan.pl<br>tel. +48 608 021 656<br>Wydział Faculty of Civil and Environmental Engineering<br>Berdychowo 4, 60-965 Poznań   |  | <b>Responsible for subject / lecturer:</b><br>Dobrochna Ginter- Kramarczyk, PhD<br>email: izabela.kruszenicka@put.poznan.pl<br>tel. +486653496<br>Faculty of Civil and Environmental Engineering<br>Berdychowo 4, 60-965 Poznań |
| <b>Prerequisites in terms of knowledge, skills and social competencies:</b>  |  |   |
| 1  | <b>Knowledge</b>   | The knowledge of chemistry at the high school level, the basic level  |
| 2  | <b>Skills</b>  | The solving of equations and systems of algebraic equations, the formulation of the chemical and physico-chemical problems in mathematics languages, solve the simple differential and logarithmic equations                    |
| 3  | <b>Social competencies</b>   | The awareness of the need to constantly update and supplement knowledge and skills.   |
| <b>Assumptions and objectives of the course:</b><br>The aim of the education in the context of this course is to strengthen and broaden the students knowledge of the basic areas of chemistry necessary for further study environmental engineering. The students will have knowledge of the structures and properties of chemical compounds and chemical reactions. They will learn about the factors affecting their reactivity. The students understanding the importance of chemical equilibrium and kinetics of the processes. During the course students will obtain the ability to design and conduct laboratory experiments and analyzing the results. The students will be write based on literature about the problems in the basic and physical chemistry. |  |   |
| <b>Study outcomes and reference to the educational results for a field of study</b>  |  |   |
| <b>Knowledge:</b>  |  |   |
| 1. The student knows the basic concepts and laws of chemistry - [K_W01, K_W03, ]   |  |   |
| 2. The student has knowledge of the properties of the substance depending on the type of bonds present in the intra- and intermolecular reactions. The student know the types of the inorganic compounds and the thermodynamic parameters of the chemical reaction. The student understand the impact of concentration, temperature and catalyst on the rate of chemical reactions - [K_W01, K_W03]  |  |   |
| 3. The student knows the principles and methods of computational chemistry (chemical laws, formulas and chemical equations, concepts: the concentration of solutions and reactions in solutions) - [K_W01, K_W03, K_W07 ]  |  |   |
| 4. The student knows and understands the chemical phenomena occurring in the environment - [K_W01, K_W03, K_W07, ]   |  |   |
| 5. The student has knowledge of the ways and methods of prevention and reduction of the chemical contaminants in the environment - [K_W05, K_W06, K_W07]   |  |   |
| <b>Skills:</b>   |  |   |

1. The student is able to obtain information on the chemical subjects from the literature, databases and other sources - [K\_U01]
2. The student is able to perceive the relationship between the structure of the substance and its physical and chemical properties; The student can balance reaction equations with redox reactions. He is able to calculations molar and percentage concentration, determination of pH, distinguishes between the basic types of bonds in the molecules. - [K\_U01, K\_U04, K\_U11]
3. The student is able to practically apply the knowledge gained in the description of basic chemical methods for the removing chemical pollutants from the environment. - [K\_U01, K\_U03 K\_U04, K\_U08, K\_U09, ]

**Social competencies:**

1. The student understands the need for teamwork in solving theoretical and practical problems - [K\_K03, K\_K04]
2. The student is aware that knowledge of chemistry is necessary in order to properly solve the problems in the profession of the environmental engineer - [K05. K\_K07K\_]
3. The student sees the need for systematic deepening and broadening its competence - [K\_K01]

**Assessment methods of study outcomes**

Lecture

- ? 1-piece written final exam time of 45 minutes, the exam includes checking skills (2 tasks), and knowledge test (3 questions);
- ? In addition, continuous assessment for all classes (rewarding activity).

Classes

- ? 2 mini-written tests during the semester;
- ? Final written test;
- ? In addition, continuous assessment for all classes (rewarding activity).

The possibility of obtaining additional points for the activity in the classroom, especially for:

- ? reporting any confusion conducting
- ? propose other ways of solving problems;
- ? assistance in the improving teaching materials;
- ? identifying opportunities to improve the teaching process.
- ?

Grading Scale:

Scale of written evaluations:

- 50% - 60% sufficient
- 61% - 70% positive plus
- 71% - 80% good
- 81 - 90% good plus
- 91 - 100% very good

**Course description**

The Lecture

Basic definitions and laws of chemistry. Elementary particles. Construction of atoms and molecules. Chemical elements. The periodic table of elements. The valence bond theory and the theory of molecular orbitals. The chemical bonds. Electronegativity and polarity. Intermolecular interaction. The chemical reactions and chemical equations. The rate of chemical reactions, the effect of concentration and temperature. Chemical equilibrium. Redox reactions. Electrolytes, dissociation, pH. Solutions and their properties. Fundamentals of electrochemistry: electrochemical series of the metals, galvanic cell, electrolysis. Outline of organic chemistry. Selected groups of organic compounds: hydrocarbons, alcohols, organic acids, amines, thiols, polymers.

Classes

Calculations based on the chemical formula of the compound. molar and procentage concentration, mixing, dilution and increasing the concentration of the solutions. Equilibria in aqueous electrolyte solutions: electrolytic dissociation, the degree of dissociation, ionic product of water, the hydrogen ion exponent - pH. redox reactions

Learning methods: information lecture, lecture with multimedia presentation, problem lecture; tutorials:accounting exercises;

**Basic bibliography:**

1. Szperliński Z., Chemia w ochronie i inżynierii środowiska, tomy 1-3, Oficyna Wydawnicza PW, W-wa 2002
2. Sienko M.J., Plane R.A., Chemia ? podstawy i zastosowania, WNT, W-wa, 1999.
3. Whittaker A.G., Mount A.R., Heal M.R., Krótkie wykłady, Chemia fizyczna, PWN S.A.,W-wa 2003.

| <b>Additional bibliography:</b>  |                             |             |
|--|-----------------------------|-------------|
| 1. Cox P.A., Krótkie wykłady. Chemia nieorganiczna, PWN S.A., W-wa 2003.                         |                             |             |
| 2. Cox P.A. Krótkie wykłady. Chemia organiczna, PWN S.A., W-wa 2003                              |                             |             |
| 3. Dojlido J.R.: Chemia wód powierzchniowych, Wydawnictwo Ekonomia i Środowisko, Białystok, 1995 |                             |             |
| 4. Lee J.D., Związła chemia nieorganiczna, PWN, W-wa, 1994.                                      |                             |             |
| 5. Pauling L., Pauling P., Chemia, PWN, W-wa, 1997   |                             |             |
| <b>Result of average student's workload</b>  |                             |             |
| <b>Activity</b>  | <b>Time (working hours)</b> |             |
| 1. Participation in lectures (contact hours)   | 30                          |             |
| 2. Participation in classes (contact hours)  | 15                          |             |
| 3. Participation in consultations related to the implementation of classes                       | 6                           |             |
| 4. Preparing for the end credits of the classes (working alone)                                  | 24                          |             |
| 5. Preparing for the end credits of the lectures (working alone)                                 | 46                          |             |
| <b>Student's workload</b>  |                             |             |
| <b>Source of workload</b>  | <b>hours</b>                | <b>ECTS</b> |
| Total workload   | 125                         | 5           |
| Contact hours  | 51                          | 2           |
| Practical activities   | 15                          | 1           |