

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Environmental Chemistry</b>		Code <b>1010134221010130914</b>
Field of study <b>Environmental Engineering Extramural First-</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>1 / 2</b>
Elective path/specialty <b>-</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>part-time</b>	
No. of hours Lecture: <b>12</b> Classes: <b>-</b> Laboratory: <b>16</b> Project/seminars: <b>-</b>		No. of credits <b>6</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art		ECTS distribution (number and %)
<b>Responsible for subject / lecturer:</b> Izabela Kruszelnicka, PhD email: izabela.kruszelnicka@put.poznan.pl tel. +48 608 021 656 Faculty of Civil and Environmental Engineering Berdychowo 4, 60-965 Poznań		<b>Responsible for subject / lecturer:</b> Izabela Kruszelnicka, PhD email: izabela.kruszenicka@put.poznan.pl tel. +48 608 021 656 Faculty of Civil and Environmental Engineering 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> 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, K_W07]		
3. The student knows and understands the chemical phenomena occurring - during wastewater treatment and water treatment - [K_W01, K_W03, K_W07, ]		
4. The student has knowledge of the ways and methods of prevention and reduction of the chemical pollution of both water, air and soil. - [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 perform a simple analysis of water; define the concept of acidity, alkalinity, oxygen consumption and water hardness; The student distinguishes between permanent hardness of hardness transient. - [ K\_U04, K\_U11]
3. The student is able to practically apply the knowledge gained in the development of simple chemical methods for assessing and removing impurities from the water. - [K\_U08, K\_U09, K\_U10, K\_U014, K\_U015, K\_U016 ]
4. The student independently develops the results of research and chemical experiments, he draw conclusions from the results - [K\_U01, K\_U05 K\_U10, K\_U014, K\_U015, K\_U016]

#### **Social competencies:**

1. The student understands the need for teamwork in the solving theoretical and practical problems - [K\_K03, K\_K04]
2. The student is aware that the knowledge of chemistry is necessary in the order to properly solve the problems of the profession of environmental engineer. - [K\_K05, K\_K07]
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 (1 task), and knowledge test (3 questions);
- In addition, continuous assessment for all classes (rewarding activity).

#### Laboratory exercises:

- ? Input checks written against each exercise;
- ? the development and defense of individual reports;
- ? 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:

Number of points rating

- 3,0-2,8 very good (A)
- 2,7- 2,5 good plus (B)
- 2,4 2,2 good (C)
- 2,1 1,9 sufficient plus (D)
- 1.8 1.6 satisfactory (E)
- below 1.6 insufficient (F)

### **Course description**

#### -Lecture

The interface. The surface of the liquid. Sorption processes. Chemical physical and ion exchange adsorption. Adsorption at the liquid-gas, liquid-liquid, liquid-solid. Solid surface, adsorption on solids. Adsorption isotherms, the impact of various factors on the adsorption process. Electrical phenomena at interfaces solid-solution. Colloids. Types of colloids. Construction of the electrical double layer, the surface potential, electrokinetic potential. Coagulation. The mechanism of coagulation. Types of coagulants stability of colloids lipophilic and liofobowych. Flocculation. Suspensions, sedimentation analysis. Foam and emulsions. The phenomenon of corrosion. Types of corrosion. The mechanism of corrosion. Methods of preventing corrosion.

#### Laboratory:

Preliminary laboratory activities; read the instructions of this exercise. General principles of health and safety in the chemical laboratories, handling of hazardous substances. Waste collection system in the laboratories. Stoichiometric calculations. Solution concentration - preparing solutions of the desired concentration, dilution mixing solutions. Determination of acidity and alkalinity. Analysis of water hardness of prepared samples. Determination of the oxygen consumption and oxygen dissolved.

<b>Basic bibliography:</b>		
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	12	
2. Participation in laboratories	16	
3. Participation in consultations related to the implementation of laboratories	6	
4. Preparing for the end credits of the laboratories	48	
5. Preparing for the end credits of the lectures	61	
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	180	6
Contact hours	34	1
Practical activities	146	5