COURSE DESCRIPTION CARD - SYLLABUS

Course name

Environmental Chemistry

Course

Field of study

Environmental Engineering Extramural First

Year/Semester

1/2

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture

18

Laboratory classes

18

Other (e.g. online)

Tutorials

18

Projects/seminars

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and Energy

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Responsible for the course/lecturer:

Izabela Kruszelnicka PhD

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Prerequisites

1.Knowledge:The knowledge of chemistry at the high school level, the basic level.

2.Skills :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.Social competencies

The awareness of the need to constantly update and supplement knowledge and skills.

Course objective

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.

Course-related learning outcomes

Knowledge

1. The student knows the basic concepts and laws of chemistry - [KIS_W01, KIS_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 - [KIS_W01, KIS_W03]

3. The student knows and understands the chemical phenomena occurring during wastewater treatment and water treatment - [KIS_W01, KIS_W03, K_W07,]

4. The student has knowledge of the methods and methods of preventing and reducing chemical pollution of both water, air and soil - [KIS_W04]

Skills

1. The student is able to obtain information on chemical topics from literature, databases and other properly selected sources - [KIS_U01]

2. The student can perform simple water analyzes; defines the concepts of acidity, alkalinity, water oxidation and hardness; distinguishes permanent hardness from transient hardness, can present and interpret results and draw conclusions - [KIS_U03]

3. The student is able to practically apply the acquired chemical knowledge in the development of simple methods of assessment and removal of contaminants especially from water, recognizes systemic and non-technical aspects and the need to apply the principles of sustainable development - [KIS_U05]

4. The student independently develops the results of chemical tests and experiments, draws conclusions from the results obtained - [KIS_U03]

Social competences

1. The student understands the non-technical aspects and effects of engineering activities and their impact on the environment. (obtained during the auditorium exercises) - [KIS_K01]

2. The student is aware that knowledge in the field of chemistry is necessary in order to properly solve problems related to the profession of environmental engineer, is aware of the responsibility for making decisions. (obtained during laboratory and auditorium classes) - [KIS_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

-1-piece written final exam time of 90 minutes, the exam includes checking skills (2 tasks), 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 .

Auditorium exercises: 2 mini tests and final test 90 minutes

Grading Scale:

Scale of written evaluations:

50% - 60% sufficient

61% - 70% positive plus

71% - 80% good

81 - 90% good plus

91 - 100% very good

Programme content

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.

Auditorium classes: Chemical calculations for the issues presented in lectures

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 acidityand alkalinity. Analysis of water hardness of prepared samples. Determination of the oxygen consumption and oxygen dissolved.

Teaching methods

information lecture, lecture with multimedia presentation, problem lecture; laboratory:laboratory experience

Bibliography

Basic

1. Whittaker A.G., Mount A.R., Heal M.R., Krótkie wykłady, Chemia fizyczna, PWN S.A.,W-wa 2003.

2. Sienko M.J., Plane R.A., Chemia ? podstawy i zastosowania, WNT, W-wa, 1999.

3. Szperliński Z., Chemia w ochronie i inżynierii środowiska, tomy 1-3, Oficyna Wydawnicza PW, W-wa 2002

4. B.i E. Gomółkowie, Ćwiczenia laboratoryjne z chemii wody, Oficyna Wydawnicza Politechniki Wrocławskiej, 1998

5. L. Gajkowska - Stefańska i inni, Laboratoryjne badania wody, ścieków i osadów ściekowych, część I i II, Oficyna Wydawnicza Politechniki Warszawskiej, 2007

Additional

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. Pauling L., Pauling P., Chemia, PWN, W-wa, 1997

4. Lee J.D., Zwięzła chemia nieorganiczna, PWN, W-wa, 1994.

5. Dojlido J.R.: Chemia wód powierzchniowych, Wydawnictwo Ekonomia i Środowisko, Białystok, 1995

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	54	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam) [1]	96	4,0

[1] delete or add other activities as appropriate