COURSE DESCRIPTION CARD - SYLLABUS

Course name
General Chemistry II [N1IŚrod1>CHOII]

Course

Field of study
Environmental Engineering

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
20

Laboratory classes
20

Other (e.g. online)
0

Tutorials
20

Projects/seminars
0

Number of credit points

7,00

Coordinators

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Lecturers

Prerequisites

1. Knowledge: Knowledge of chemistry at the level of secondary school-leaving examination and general chemistry lecture cycle. 2. Skills: Solving equations and systems of algebraic equations, formulating chemical, physicochemical and environmental problems in the language of mathematics, solving simple differential and logarithmic equations 3. Social competencies: Awareness of the need to constantly update and supplement knowledge and skills.

Course objective

The aim of education within this subject is to consolidate and expand students' knowledge of environmental chemistry necessary to further study environmental engineering. The student will become familiar with the factors affecting environmental reactions. Understand the importance of chemical balance and kinetics for the processes taking place in the world around us. As part of the subject, he will acquire the ability to design and conduct laboratory experiments, and work out the results. Ability to write an independent problem in environmental chemistry and physical chemistry based on literature sources.

Course-related learning outcomes

Knowledge:

1. The student has basic knowledge in the field of ecology and environmental chemistry useful for formulating and solving simple tasks in the field of environmental engineering.
2. The student has ordered, theoretically founded general knowledge covering key issues in environmental chemistry.
3. The student has detailed knowledge related to: assessment of water pollution, water protection, sanitary chemistry.

Skills:
1. The student is able to obtain information on chemical topics from literature, databases and other properly selected sources.
2. The student is able to formulate and solve engineering tasks in the field of environmental engineering to see their systemic and non-technical aspects and the need to apply the principles of sustainable development.

Social competences:
1. The student is aware of the responsibility for making decisions.
2. The student is aware of the non-technical aspects and effects of engineering activities, including its impact on the environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
1-part written final exam, duration: 45 minutes, exam includes checking skills (2 tasks), checking knowledge (3 questions).
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.
Auditorium exercises:
3 mini tests.
Laboratory exercises:
Written entrance tests before each exercise.
Preparation and individual defense of reports.
Continuous assessment in every class (rewarding activities).
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:
1. Electrolytic dissociation.
2. Redox. pH.
3. Phase boundary. Liquid surface. Sorption processes. Chemical, physical and ion exchange adsorption. Adsorption on the liquid-gas, liquid-liquid, liquid-solid boundary. Surface of solids, adsorption on the surface of solids. Adsorption isotherms, influence of various factors on the adsorption process.
4. Electrical phenomena at the solid-solution phase boundaries. Colloids. Types of colloids. Construction of the electric double layer, surface potential, electrokinetic potential.
5. Coagulation. Coagulation mechanism. Types of coagulants. Stability of lyophilic and lyophobic colloids. Flocculation. Suspensions, sedimentation analysis. Foams and emulsions.
6. Corrosion phenomenon. Types of corrosion. Corrosion mechanism. Ways to prevent corrosion.
Auditorium exercises:
1. Dissociation.
2. Ion product.

3. pH, pH of natural waters.
4. Redox reactions.
5. Water alkalinity, water acidity, carbon dioxide, water corrosivity, water hardness.
6. Dissolved oxygen, BZT5, COD.
7. Salt hydrolysis, solubility product.
Laboratory exercises:
1. Initial laboratory activities; reading the exercise instructions. General rules of occupational health and safety in chemical laboratories, dealing with harmful and dangerous substances (safety data sheets). Waste collection system in laboratories.
2. Acidimetry. Concentration of solutions (preparation of solutions with a given concentration, dilution and mixing of solutions).
3. Determination of acidity and alkalinity. Hardness analysis of prepared water samples. Determination of oxidizability and dissolved oxygen. Physical properties, continued: conductivity, color, turbidity, taste, smell, temperature, phosphates, alkalinity, hardness, calcium, magnesium (types, calculations), acidity, carbon dioxide (forms, balance diagram).

Teaching methods

Informative lecture, lecture with multimedia presentation, problem lecture.
Auditorium exercises: problem method, solving tasks.
Laboratory excersises: experiment method, practical exercises.

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	175	7,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	115	4,50