COURSE DESCRIPTION CARD - SYLLABUS

Course name

Enviromental Chemistry and Biology

Course

Field of study

Sustainable Building Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

English

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

Student starting this course should have a basic knowledge of chemistry and biology at high school level. He should also have the ability to work in a group and search for information in recommended sources.

Course objective

The aim of education within this course is to acquire knowledge about selected issues in environmental chemistry and biology. These will include information about chemistry and microbiology of water, air microbiology, chemical water pollution, microbiological contamination of water and air. The student will also acquire the basic skills necessary for performing analyzes in the laboratory of water chemistry and microbiological laboratory.

Course-related learning outcomes

Knowledge

- Student has knowledge of the basic issues of chemistry and environmental biology useful for formulating and solving problems related to sustainable building engineering.

- Student has structured and theoretically based knowledge of key problems related to water chemistry and microbiology of water, air microbiology, chemical pollution of water, microbiological contamination of water and air.

Skills

- Student is able to obtain information from literature, databases, legal regulations and standards, and other properly selected information sources; can integrate the obtained information, interpret and evaluate it, as well as draw conclusions, formulate, discuss and justify opinions.

- Student is able to carry out both chemical and biological experiments.

- Student is able to clearly present and interpret the results obtained in chemical and biological experiments and draw conclusions based on them.

- Student is able to plan and organise work; both individual and team; can cooperate with other people, is prepared to team work.

Social competences

- Student takes responsibility for the accuracy and reliability of results and their interpretation.

- Student understands the need for team work and is responsible for safety of his own work and the work of his team.

- Student is able to critically evaluate the results of their own work.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- Written exam after finishing the lectures - test with closed and open questions; the exam date will be given at the beginning of the semester; duration: 90 minutes, (30 - 40 questions).

Evaluation of lectures - grading scale:

50-60% - 3.0

61-70% - 3.5

71-80% - 4.0

81-90% - 4.5

91-100% - 5.0

Laboratory classes:

- Each laboratory class will be preceded by a 15-minute test checking students' knowledge and preparation.

- Preparation and individual or team defense of the laboratory report on each lab class.

- Additional points/grades for activity during classes, in particular for: signaling mistakes and ambiguities of the lecturer; proposing alternative ways of solving tasks and problems; help in improving teaching materials; indicating possibilities of improving the didactic process.

Evaluation of laboratory classes - grading scale for tests:

50-60% - 3.0

61-70% - 3.5

71-80% - 4.0

81-90% - 4.5

91-100% - 5.0

Programme content

Environmental Chemistry - lectures

1. Elements of inorganic and physical chemistry

Basic definitions used in environmental chemistry; chemistry in construction; basic concepts and laws of chemical; basic chemical reactions occurring in the environment.

2. Chemistry of water

Construction of a water molecule; physico-chemical analysis of natural ingredients and pollutants included in the water; physical properties of water.

3. Chemical pollution

Nitrogen compounds, heavy metals in water and their toxic effects, natural organic compounds; pollution of urban and industrial wastes, pollution of crude oil and its derivatives. Pollution with synthetic organic compounds: phenols, surface-active compounds, plant protection agents, polycyclic aromatic hydrocarbons.

Environemntal Biology - lectures

1. Basics of environmental microbiology

Basic definitions used in environmental microbiology; microbiology and building engineering; taxonomy of living organisms; the basics of the structure of prokaryotic cells; basic information about the life processes of prokaryotes

2. Microbiology of water

Autochthonous and allochthonous microorganisms of surface waters; indicators of microbiological pollution of water; polish and international standards for the quality of drinking water; diseases caused by bacteria developing in surface water and in sanitary installation; microbiological corrosion.

3. Air microbiology

Air microflora; bioaerosol; indicators and legal regulations of microbial air pollution; biodeterioration of technical materials; airborne diseases.

Environamntal Chemistry - laboratory classes

1. Chemical analysis of water - alkalinity and acidity

Regulations and health and safety regulations applicable at the Laboratory of Water Chemistry; characteristics of laboratory equipment; determination of alkalinity and acidity; calculation of the amount of hydroxides, carbonates and bicarbonates based on F and M basicity; calculations and tasks.

2. Water hardness

Carbonate hardness of water; uncarbonated hardness of water; methods for determining the hardness of total water; determination of total water hardness with sodium edetate; examples and tasks.

3. Oxidation of water

Oxidation in an acidic environment; examples and calculations.

Environmental Biology - laboratory classes

1. Structure of bacterial cell and colony

Health and Safety Regulations at the Laboratory of Environmental Biology and Hydrobiology; construction of the microscope; execution of microscopic specimens stained with a simple and complex method (Gram staining); observation and describing features of bacterial cells and colonies.

2. Bacteriological sanitary analysis of water

Microbiological methods for assessing the quality of drinking water; microbiological assessment of drinking water quality.

3. Microbiological sanitary analysis of air

Methods used for microbiological assessment of air quality; microbiological assessment of air quality.

Teaching methods

Lecture: multimedia presentation, informative lecture, problem lecture.

Laboratory: multimedia presentation, presentation illustrated with examples given on a blackboard, demonstration, experiment, laboratory experiments conducted in accordance with the instructor's instructions.

Bibliography

Basic

1. Darshan Singh Sarai, Basic Chemistry for Water and Wastewater Operators Paperback, 2005

2. Pepper I. L., Gerba C. P., Gentry T. J., Environmental Microbiology, 3rd Edition

Additional

1. Standard Methods for the examination of water and wastewater, edited by: Eaton, Clesceri, Rice, Greenberg

2. Willey J., Sherwood L., Woolverton C. J., Prescott's Microbiology, 8th Edition, 2017

3. Harley J., Laboratory Exercises in Microbiology 10th Edition

4. Yates M. V., Nakatsu C. H., Miller R. V., Pillai S. D., Manual of Environmental Microbiology, Fourth Edition, 2016 (e-book available on KNOWEL Library)

5. Brandt M. J., Johnson K. M., Elphinston A. J., Ratnayaka D. D., Twort's Water Supply, 7th Edition, 2016 (e-book available on KNOWEL Library)

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate