STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Enviromental Chemistry and Biology**		Code **1010101111010109308**
Field of study **Sustainable Building Engineering First-cycle**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 1**
Elective path/specialty **-**	Subject offered in: **English**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **-**		No. of credits **2**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **2 100%** **2 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	- The knowledge of chemistry and biology at the high school level, the basic level.
2	**Skills**	- Using available sources of information - The ability to perform observations of biological objects and processes and draw conclusions based on them. - Solving equations and systems of algebraic equations, formulating chemical and physicochemical problems in the language of mathematics.
3	**Social competencies**	- The student is aware of the necessity of constantly updating their knowledge and skills as well as expanding their competences. - The student is able to work in a group.

Assumptions and objectives of the course:

The aim of education in this course is to consolidate and broaden by students knowledge of basic chemistry issues necessary for further study and acquisition of basic knowledge and skills in the field of environmental microbiology. The student acquires knowledge of the structures and properties of chemical compounds and chemical reactions as well as biological processes. He will become familiar with the factors affecting their reactivity. He will have the ability to independently write a problem in general chemistry and biology based on literature sources.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student has knowledge in areas of mathematics, physics, chemistry, biology and other sciences useful in formulating and solving problems associated with sustainable building engineering (civil engineering, environmental engineering and architecture). - [KSB_W01]

2. Student has well-founded theoretical knowledge about key issues in environmental chemistry and environmental biology. - [KSB_W19]

Skills:

1. Student knows how to retrieve information from literature, databases and other properly selected sources; knows how to integrate the information thus retrieved, how to interpret it and how to draw conclusions and formulate and justify opinions. - [KSB_U01]

2. Student knows how to carry out chemical and biological experiments; knows how to clearly present and interpret results obtained and draw conclusions. - [KSB_U08]

3. Student knows how to plan and organise work both individual and in teams, knows how to collaborate with others, is prepared to work in team, is prepared to collaborate with other individuals in interdisciplinary design teams (specialists in different areas). - [KSB_U26]

Social competencies:

1. Student takes responsibility for reliability of results and their interpretation. - [KSB_K02]

2. Student understands the need for team work and is responsible for safety of hi work and the work of his team. - [KSB_K04]

3. Student is aware of the necessity of developing professional and personal competencies; understands and is aware of possibilities of continuous learning (second and third cycle studies, postgraduate courses). - [KSB_K05]

4. Student has the skill of critical assessment of results of his work. - [KSB_K08]

Assessment methods of study outcomes

Lecture:

- Written exam after finishing the lectures; in the form of a test - closed questions; the date given at the beginning of the semester; duration: 90 minutes, (30 - 40 questions, checking the effect of W01, W19, U01)

Laboratories:

- Each laboratory exercise will be preceded by a 15-minute pass checking students' preparation to do the exercise (checking the effect of U01, U08)

- Development and individual or team defense of written reports on each exercise (checking the effect of U01, U08, U26, K02, K08)

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 assessment

Scale of written work:

50-60% - 3.0

61-70% - 3.5

71-80% - 4.0

81-90% - 4.5

91-100% - 5.0

Course description

Chemistry - lectures

Lecture 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.

Lecture 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.

Lecture 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.

Biology - lectures

Lecture 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

Lecture 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.

Lecture 3. Air microbiology

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

Chemistry - laboratory exercises

Exercise 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.

Exercise 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.

Exercise 3. Oxidation of water

Oxidation in an acidic environment; examples and calculations.

Biology - laboratory exercises

Exercise 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 stain); observation and determination of bacterial colonies

Exercise 2. Bacteriological sanitary analysis of water

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

Exercise 3. Microbiological sanitary analysis of air

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

Basic bibliography:

1. 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

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

Additional bibliography:

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

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures (contact hours)	15
2. Participation in laboratories (contact hours, practical)	15
3. Preparation for laboratories at home (independent work)	10
4. Preparation of a report on laboratories at home (independent work)	10
5. Participation in consultations (contact hours)	3
6. Additional own work, e.g. work in the library (independent work)	5
7. Participation in the credit (contact hours)	2

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	35	1
Practical activities	15	0