STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Biology and Biochemistry**		Code **1010102211010132025**
Field of study **Environmental Engineering Second-cycle**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 1**
Elective path/specialty **Water Supply, Water and Soil Protection**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **15** Classes: **-** Laboratory: **30** Project/seminars: **-**		No. of credits **3**
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	ECTS distribution (number and %)
technical sciences	**2 67%**
Technical sciences	**2 67%**
natural sciences	**1 33%**
Biology	**1 33%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of the biology.
2	**Skills**	The ability to use literature and self-education, making observations, drawing conclusions, working in a group.
3	**Social competencies**	Is aware of the need to learn, able to work in a group.

Assumptions and objectives of the course:

- To familiarize students with the use of microorganisms in the production processes of water and wastewater treatment. To acquaint students with the metabolism of organisms and their role in the circulation of matter and energy.

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

Knowledge:

1. The student knows the basic features and metabolic functions of organisms - [K2_W01]
2. The student knows the steps, function and usability nutrition processes of microorganisms in wastewater treatment and production - [K2_W03, K2_W06]
3. The student knows the types of breathing and conditions will be set up at various stages of aerobic respiration and anaerobic eg. In wastewater treatment - [K2_W04]
4. The student knows the circuit elements and compounds in the environment and participation in these processes of microorganisms - [K2_W06]
5. The student knows the function of microorganisms involved in biological wastewater treatment, mechanism and hydrobotanical treatment plant operating conditions - [K2_W06, K2_W07]

Skills:

1. The student can use knowledge of nutrition and respiration processes to control the operation of sewage treatment plant and water treatment steps - [K2_U08]

2. The student is able to use the appropriate plants for use in the treatment hydrobotanical, use microorganisms for wastewater treatment and give them the conditions for the proper functioning and resolve operational problems occur during biological wastewater treatment - [K2_U11, K2_U10]

3. Student is able to determine, calculate and specify the class of water quality based on the results of analysis of physico-chemical and microbiological and perform a graphical assessment of the balance of the ionic - [K2_U10, K2_U18]

4. Student is able to utilize the biomonitoring of water quality control, perform simple laboratory experiments and work safely in the laboratory and perform observations, be documented in writing and graphics, and draw valid conclusions from laboratory experiments - [K2_U01, K2_U15, K2_U13]

Social competencies:

1. he student is aware of the desirability of the study of biological processes - [K2_K05]

2. The student is aware of the presence of organic substances in wastewater, microbial pathogens, overlapping processes of respiration and nutrition - [K2_K07, K2_K02]

3. The student is aware of the use of appropriate control methods of wastewater treatment processes and can be done - [K2_K02]

4. Student is able to rationally manage natural resources and knows the principles of sustainable development - [K2_K02]

Assessment methods of study outcomes

At the time of the examination session takes place written test covering the issues discussed in lectures and laboratory exercises (W1,3,4,6,7; U1,8,10,11,13,15,18; K2,5,7). The condition of the credit of the lectures is to have credit for laboratory exercises.

Throughout the semester, students are consulted (1.5 h / wk.).

- Examination of the material from the lectures in the session, and the amendment shall be in writing.

Obtaining credits of lectures (20-25 questions, max. 20-25 pts.). For each answer you get from 0 to 1 point. Approximately 50% of the maximum points must be obtained. Detailed information on scoring and rating scale are given before crediting.

Course description

-Place Biology biochemistry in Environmental Engineering; Characteristics of the metabolism of organisms; assimilation and dissimilation processes; organisms feeding grounds; autotrophs and heterotrophs.

Nutrition - a source of energy. Photo- and chemotrofy; Photosynthesis in bacteria; Chemosynthesis and its role in environmental engineering (nitrification bacteria ferruginous, manganese, sulfur, hydrogen).

Breathing as the energy process. The role of ATP as an energy carrier. Types of breathing. Aerobic respiration, anaerobic fermentations; stages function. Denitrification, ammonification, sulphate reduction and carbonates. Alcoholic fermentation, butterhead, lactic, propionic.

Circuit matter and energy. Circulation of matter in the environment; Carbon cycle; circulation of nitrogen, phosphorus, sulfur and water; The role of microorganisms in the circuit elements.

Chemical components of organisms. Water and its role in organisms. Proteins, fats, carbohydrates? construction, distribution, function.

Biocatalysts: structure and function of enzymes, the mechanism of action of enzymes, enzyme classification. Biological treatment of wastewater. Treatment methods. Sludge? sediment parameters working well. Microorganisms present in the sediment and their role in the treatment of wastewater. The swelling (swelling sludge). The role of activated sludge aeration chamber.

Biological ponds. Types of biological wastewater treatment ponds. Hydrobotanical purifiers.

Topics laboratory:

1. Assessment of the pollution of surface water and ion balance.

2. Breathing activated sludge method of Warburg and microscopic analysis of activated sludge.

3. Chlorination of water to the point of inflection.

4. Consumption of water and sediment hydrobiological research. Photosynthesis in algae culture.

5. Photosynthesis in algae, reading. The transformation of nitrogen and phosphorus compounds in water and soil culture.

6. The transformation of nitrogen and phosphorus compounds in water and soil, to read.

7. Processes during infiltration of surface water and their disinfection on the example of the aqueduct in Poznan (fieldwork in Aquanet SA).

Basic bibliography:

1. Michałkiewicz M., Fiszer M. Biologia sanitarna - ćwiczenia laboratoryjne. Skrypt Politechniki Poznańskiej, 2011.

2. Libudzisz Z., Kowal K., Żakowska Z. Mikrobiologia techniczna. Tom 1 i 2. PWN Warszawa

3. Kunicki-Goldfinger W., Frejlak S. Podstawy mikrobiologii i immunologii. PWN W-wa.

Additional bibliography:

1. K. Starmach, S. Wróbel, K. Pasterniak. Hydrobiologia : limnologia. Warszawa: Państwowe Wydaw. Naukowe, 1978
2. Mirosław M. Bobrowski. Podstawy biologii sanitarnej
3. Michałkiewicz Michał, Jeż-Walkowiak Joanna, Sozański Marek M. 2011. Dezynfekcja ścieków bytowo-gospodarczych. Gaz, Woda i Technika Sanitarna, T. 85, nr 3, str. 103-109. p-ISSN: 0016-5352

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	15
2. Participation in the laboratory exercises	30
3. Preparation for laboratory	10
4. Additional work of its own; eg. the library, etc.	5
5. Participation in the consultation	3
6. Preparation for the exam	10
7. Participation in the exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	75	3
Contact hours	50	2
Practical activities	30	1