COURSE DESCRIPTION CARD - SYLLABUS

Course name
Environmental biotechnology [S2IŚrod1-ZwWOWiG>BŚ]

Course

Field of study
Environmental Engineering

Year/Semester
1/1

Area of study (specialization)
Water Supply, Water and Soil Protection

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Mateusz Łężyk
mateusz.lezyk@put.poznan.pl

Lecturers

dr inż. Mateusz Łężyk
mateusz.lezyk@put.poznan.pl

Prerequisites

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.

Course objective

To familiarize students with the use of microorganisms and application of selected biotechnologies for environmental protection. To acquaint students with the metabolism of organisms and their role in the circulation of matter and energy

Course-related learning outcomes

Knowledge:
1. The student has expanded and in-depth knowledge of environmental biology and biochemistry useful for formulating and solving complex tasks in the field of environmental engineering.
2. The student has ordered, theoretically founded general knowledge covering environmental biology, technical microbiology and elements of biotechnology.
3. The student has theoretically grounded detailed knowledge related to: - biological wastewater

treatment processes, - microbiological methods of environmental control.

Skills:
1. The student is able to plan and carry out experiments, including measurements in the field of: systems for research and control processes, including biochemical and microbiological at various stages of wastewater treatment and water production.
2. The student is able to use analytical and experimental methods to formulate and solve engineering tasks and simple research problems in the field of environmental engineering.

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

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

At the time of the examination session takes place written test covering the issues discussed in lectures and laboratory exercises. 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 45-50% of the maximum points must be obtained. Detailed information on scoring and rating scale are given before crediting

Programme content

Place of Biology, biochemistry and biotechnology 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.
Biotechnologies for environmental protection and engineering: Bioremedation, biological treatment of wastewater, biorefinery concept, bioproduction of fuels and energy, biosensors.
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.

Teaching methods

information lecture, lecture with multimedia presentation, problem lecture. Laboratories: exercise, problem, case study, measurement, observation, experiment

Bibliography

Basic:

1. Michałkiewicz M., Fiszer M. Biologia sanitarna - ćwiczenia laboratoryjne. Skrypt Politechniki Poznańskiej, 2011
2. Lampert W., Sommer U. Ekologia wód śródlądowych. Warszawa, PWB, 2001.
3. Kunicki-Goldfinger W. Życie bakterii. Wydawnictwo Naukowe PWN, 2001

Additional:
1. Singleton P. Bakterie w biologii, biotechnologii i medycynie. PWN, 2000.
2. Nicklin J., Graeme-Cook K., Paget T., Killington R.A. Mikrobiologia - krótkie wykłady. PWN, 2000.
3. Zaremba M.L., Borowski J. Mikrobiologia lekarska. PZWL, 2001

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00