

Course title Technologia remediacji gleb/ Technology of soil remediation		ECTS code 13.3.0387	
Name of unit administrating study Faculty of Chemistry			
Studies			
Field of study	Type	Form	
Chemistry	Master	Full-time studies	
Prof. dr hab. inż. Adriana Zaleska-Medynska			
Forms of classes, the realization and number of hours		ECTS credits	
A. Forms of classes, in accordance with the UG Rector's regulations lecture, laboratory classes		classes 30 h tutorial classes 5 h student's own work 15 h TOTAL: 50 h - 2 ECTS	
B. The realization of activities In-class learning			
Number of hours Lecture 15 h, laboratory classes 15 h			
The academic cycle 2019/2020 summer semester			
Type of course obligatory		Language of instruction Polish	
Teaching methods Laboratory experiments Lectures including multimodal presentations		Form and method of assessment and basic criteria for evaluation or examination requirements	
		A. Final evaluation, in accordance with the UG study regulations Zaliczenie na ocenę	
		B. Assessment methods final grade based on partial grades received during the semester written exam with open and test questions	
		C. The basic criteria for evaluation or exam requirements Wykład written test: a positive grade of the written test consisting of open questions covering the issues listed in the program content of the lecture and laboratory exercises the grade scale according to the UG Study Regulatory - oral examination - supplement to the written test, but only for those students who obtained 40-50% of points possible to receive from the written credit, Laboratory exercises: - average of grades obtained from laboratory exercises and the final test, the scale is in accordance with the University of Gdańsk Studies Regulations. Obtaining above 51% of points from laboratory exercises, i.e.: entrance tests covering the subject of performed experiments, preparation of the experimental part, preparation of results obtained in the experimental part (reports), activity and cooperation in the group, and compliance with the principles of work safety in the chemical laboratory and obtaining over 51% of	

points from the final test covering the abovementioned scope

Required courses and introductory requirements

basic chemistry, inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry. Basic knowledge of basic chemistry, organic chemistry and physical chemistry, as well as basic knowledge of chemical analysis methods.

Aims of education

- Introduce students with all issues listed in the lecture program content.
- Introduce students with the main stages of the technological process used to remediate contaminated soils.
- Introduce students with techniques of instrumental analysis.
- Developing the skill of making independent calculations necessary for the correct interpretation of the results of analyzes
- Developing the skill of independently choosing the appropriate remediation technique for a given goal.

Course contents

A. Problems of the lecture:

Sources, types of pollution. Characteristics of impurities: pesticides and petroleum substances, heavy metals and radionuclides. Soil characteristics. Types of soil sorption. Spread of harmful substances in the environment. Characteristics of groundwater. The fate of pollution in water and soil (chemical, biochemical and photochemical processes). Impact of pollution on physical and mechanical properties of soils. Soil remediation - definitions and basic tasks of the process. Division of soil remediation methods. Physico-chemical methods of soil reclamation. Biological methods of soil reclamation. Thermal methods of soil reclamation. Stabilization and solidification. In-situ and ex-situ methods for groundwater treatment. Sealing methods for landfills and types of insulation layers.

B. Problems of laboratory exercises:

Basics of laboratory work, performance of thematic exercises related to the removal of contaminants from contaminated soils

Bibliography of literature

A.1. wykorzystywana podczas zajęć

Kowalik P., Ochrona środowiska glebowego, PWN, Warszawa, 2001.

Zadroga B., Olańczuk-Neyman K., Ochrona i rekultywacja podłoża gruntowego, Wydawnictwo Politechniki Gdańskiej, 2001.

A.2. studiowana samodzielnie przez studenta

Greinert H., Ochrona gleb, Wydawnictwo Politechniki Zielonogórskiej, Zielona Góra, 1998.

Gworek B (red), Technologie rekultywacji gleb, Wydawnictwo Naukowe Gabriel Borowski, Warszawa 2004

B. Literatura uzupełniająca

Szyc J., Odcieki ze składowisk odpadów komunalnych, Wydawnictwo Naukowe Gabriel Borowski, Warszawa 2003

Olszanowski A. (red.), Remediacja i bioremediacja zanieczyszczonych wód i gruntów oraz wykorzystanie modelowania i technik informatycznych w inżynierii, Wydawnictwo Politechniki Poznańskiej, 2001.

Knowledge

1. The student defines the basics of risk assessment of the spread of pollution in the environment and the threat arising from soil pollution.
2. Understands the relationship between the structure and properties of a chemical compound and its behavior in the environment
3. Understands the relationship between the properties of pollution, the properties of soil particles, and the choice of remediation technology for contaminated soils
4. Is able to assess the exposure of individual components of the environment to the presence of chemical compounds depending on the manner and scale of their use
5. Lists and classifies technologies used for soil remediation

6. Distinguishes and characterizes individual soil remediation technologies used in in-situ and ex-situ

Skills

1. Classifies types and sources of pollution
2. Demonstrates the ability to perform basic physicochemical and technological measurements important for removing contaminants from the soil environment
3. Plans and develops technologies for remediation of contaminated land
4. Plans and conducts simple experiments in the field of environmental remediation technologies.
5. Talks about issues of environmental remediation technology in understandable language, using the correct nomenclature.
6. Evaluates selected properties of contaminated soils and assesses the effectiveness of remediation of contaminated soils (by bioremediation and washing)

Social competence

1. Classifies types and sources of pollution
2. Demonstrates the ability to perform basic physicochemical and technological measurements important for removing contaminants from the soil environment
3. Plans and develops technologies for remediation of contaminated land
4. Plans and conducts simple experiments in the field of environmental remediation technologies.
5. Talks about issues of environmental remediation technology in understandable language, using the correct nomenclature.
6. Evaluates selected properties of contaminated soils and assesses the effectiveness of remediation of contaminated soils (by bioremediation and washing)