GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00037578		
Field of study	Green Technologies		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	English
Semester of study	6	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Anna Zielińska-Jurek	
	Teachers	dr hab. inż. Anna Zielińska-Jurek	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	45	2.0	28.0	75

Subject objectives	Gaining the knowledge regarding the types of soil and water pollution and forms of environmental degradation, with particular emphasis on the ground and groundwater. Analysis of methods of protecting the environment against pollution, especially from anthropogenic sources, as well as methods of cleaning, reclamation and remediation. The final goal is the ability to independently identify environmental hazards and select the appropriate method of its elimination.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W03] has a basic knowledge of soil, air and water pollutants, design and supervision of environmentally friendly technologies and technologies which do not produce waste, knows technology of cleaning and neutralization of industrial waste and wastewater management, has a basic understanding of the theoretical basis of methods and types of apparatus used in chemical analysis of environmental pollutants	the student is able to select the proper method of soil remediation to type pollution and assess costs related to the application remediation methods.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U02] is able to operate equipment and perform typical analyzes of studies of environmental pollution, is able to carry out an analysis of typical environmental pollution and simple devices according to specification	knowledge of physicochemical properties soil contamination (heavy metals, petroleum substances, pesticides, pharmaceuticals) knowledge in the field of soil and land remediation technology.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
[K6_W04] is aware of the importance of environmental protection and has a basic knowledge of chemical and biological threats to the environment, with particular emphasis on anthropogenic factors, has a basic knowledge of knowledge of the principles of sustainable development as well as national and European environmental management conditions.	Student knows the basic principles of production quality control, and is able to analyze the results, also knows the basic aspects regarding chemical management with particular attention on compounds polluting the environment in relation to economic activity	[SW1] Assessment of factual knowledge

Subject contents

Lecture: Pollutants: source and classifications. Pollutants characteristics: pesticides, petroleum hydrocarbons, heavy metals, radioactive elements. Soil characteristics. Types of soil sorption. Migration of pollutants in the environment. Ground water characteristics. Fate of pollutants in soil, surface and groundwater (chemical, biochemical and photochemical processes). The effect of pollutants on the physical and mechanical properties of soil.Land reclamation basic terms and the aim of the process. Classification of remediation technologies. Physicochemical soil remediation. Biological soil remediation. Thermal soil remediation. Solidification and stabilization. Groundwater treatment: in-situ and ex-situ technologies. Method of waste dump isolation and its isolation layers. Laboratory: Bioremediation of polluted soil. Remediation of soil polluted with heavy metals Chemical methods of dump effluents treatment: ozonation, Fenton reaction and photochemical oxidation. Remediation of oil polluted soil. Cation mobility in soil.

Prerequisites and co-requisites

- basic knowledge in the field of environmental protection,

- basics of chemistry, physics

- knowledge of basic physicochemical parameters

- ability to assess environmental issues

- the ability to logically assess the situation

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture (2 tests during the semester)	60.0%	60.0%
Laboratory (all the laboratories must be pass)	60.0%	40.0%

Recommended reading

Basic literature	Hasegawa, Hiroshi, M. M. Rahman, Ismail, Rahman, Mohammad Azizur (Eds.) 2016. Environmental Remediation Technologies for Metal-Contaminated Soils
Supplementary literature	Zadroga B., Olańczuk-Neyman K., Ochrona i rekultywacja podłoża gruntowego, Wydawnictwo Politechniki Gdańskiej, 2001 Szyc J., Odcieki ze składowisk odpadów komunalnych, Wydawnictwo Naukowe Gabriel Borowski, Warszawa 2003Olszanowski A. (red.), Remediacja i bioremediacja zanieczyszczonych wód i gruntów oraz wykorzystanie modelowania i technik informatycznych winżynierii, Wydawnictwo Politechniki Poznańskiej, 2001.
eResources addresses	Adresy na platformie eNauczanie: Environmental Remediation Technologies (2023/2024) - Moodle ID: 35190 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35190

Example issues/ example questions/ tasks being completed	The impact of industrial processes on the environment. Environmental Geochemistry Ecological Footprint REACH Characteristics of pollutants: pesticides, petroleum products. Soil characterization and sorption process (mechanical, physical, chemical and biological). Physicochemical processes related to migration pollution. Transmission of harmful substances in the environment
Work placement	Not applicable