University of Gdańsk

Subject card

Subject name and code	Environmental engineering, PG_00103520		
Field of study	Environmental Protection		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	undergraduate studies	Subject group	Obligatory subject group in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish polish
Semester of study	5	ECTS credits	3.0
Learning profile	academic	Assessment form	
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Ewelina Grabowska-Musiał	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30	5.0	40.0	75

Subject objectives	
	Introduce students with the basic technological processes used in water treatment Introduce students with the basic processes of wastewater treatment and treatment of sewage sludge used in municipal wastewater treatment plants and in industrial plants and the devices corresponding to these processes. Acquiring basic knowledge about the types and sources of air pollution and the principles of operation of waste gas purifying devices

Learning outcomes

Course outcome	Subject outcome	Method of verification
[OŚL3_W02] Characterises the relationships and relationships between various disciplines of natural sciences and science, uses knowledge of mathematics, physics, chemistry and biology in the description of basic concepts, concepts and principles in environmental protection.	explains the principles of selecting water, sewage and gas treatment technologies waste depending on the type of pollutants removed	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[OŚL3_W11] Discusses measurement systems and analysis techniques used in monitoring the state of the natural environment.	characterizes the methods and explains the operation of devices used in treatment water, wastewater and waste gas treatment	[SW1] oral statement/ conversation/discussion
[OŚL3_K06] Knows and appreciates the practical application of the acquired knowledge and skills in solving problems.	explains the processes occurring in various elements of the environment after introduction of contaminants into them;	[SK5] implementation of a problem task
[OŚL3_U02] Plans, selects appropriate research and measuring equipment and devices, performs physicochemical measurements and experiments; analyses the results and draws conclusions based on them.	plans, performs and interprets basic physico-chemical analyzes of water, sewage and sewage sludge	[SU1] oral statement/conversation/ discussion [SU6] demonstration of practical skills [SU8] observation of student's independent or team work
[OŚL3_U12] Uses environmental protection instruments, including the concept of sustainable development, in communicating with the socio-economic environment.	applies basic analytical techniques, applicable legal acts in assessing the quality of the natural environment and the effectiveness of devices used in water treatment and sewage treatment	[SU1] oral statement/conversation/ discussion

Subject contents

Lecture issues
Principles of green chemistry and green engineering. Types and sources of water, soil and air pollution. Water parameters. Municipal and industrial wastewater treatment technologies. Sewage sludge management methods. Classification of soil remediation methods. Physico-chemical methods of soil reclamation. Thermal methods of soil remediation. Air dedusting methods. Dry dedusting. Wet dedusting. Odor control. NOx control. NOx removal from flue gases. Flue gas desulphurization. Air protection by desulfurization of fossil fuels. CO2 emission control. Photocatalytic methods of air purification.

Prerequisites and co-requisites

Prerequisites describing the course of natural and anthropopressory physical, chemical and biological processes occurring in the natural environment; application of basic methods and techniques of work in a chemical laboratory; defining and searching for applicable legal regulations and instruments of applying the law in environmental protection

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	51.0%	100.0%

Recommended reading

Basic literature	Grabowska-Musiał Ewelina., unpublished materials, made available to students during classes 1. Instructions for auditorium-laboratory exercises 2. Hermanowicz I., Dojlido J., Fizyczno-chemiczne badania wody i ścieków, Arkady, Warszawa 1999 3. A.L. Kowal, M. Świderska-Bróż, Oczyszczanie wody, Wydawnictwo Naukowe PWN, Warszawa 2009 4. Dymaczewski Z. (red), Poradnik eksploatatora oczyszczalni ścieków, PZIiTS, Poznań 2011 5. Bartkiewicz B., Oczyszczanie ścieków przemysłowych, Wydawnictwo Naukowe PWN, Warszawa 2007 6. Jędrczak A., Biologiczne przetwarzanie odpadów, Wydawnictwo Naukowe PWN, Warszawa 2007 7. Imhoff K., Kanalizacja miast i oczyszczanie ścieków, Projprzem-EKO, Bydgoszcz 1996 8. Warych J., Oczyszczanie przemysłowych gazów odlotowych, WNT Warszawa 1994 Extracurricular readings
Supplementary literature	brak
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Explain the concept of sustainable development Briefly discuss three environmental protection strategies Using a selected example, discuss the circulation of pollutants in the environment List and briefly discuss the main sources of atmospheric pollution List and briefly discuss methods for reducing sulfur emissions into the atmosphere Discuss in detail three selected methods of removing sulfur from solid fuels Draw a diagram of the installation and, based on it, discuss the Claus process of desulfurization of crude oil and petroleum products Draw a diagram of the installation and, based on it, discuss the process of hydrodesulfurization of crude oil and petroleum products List and briefly discuss the methods of flue gas desulfurization Draw a diagram of the installation and, based on the drawing, discuss the principle of coal desulfurization using the difference in the density of coal and pyrite Discuss the lime-lime method as an example of the wet method used for flue gas desulfurization List and briefly discuss methods of reducing CO2 emissions into the atmosphere List and briefly discuss the methods of separating CO2 from exhaust gases List and briefly discuss the methods of geological CO2 storage What determines the choice of water treatment technology? List the main groups of contaminants found in water and methods of removing them Describe the characteristics of slow and fast filters. Explain what it is and how it works. Discuss one selected method for removing hardness from water Discuss the method of iron removal/demanganization of water Discuss the coagulation process (type of impurities removed during coagulation, mechanism, coagulants used) Discuss the method and devices used to remove suspensions with a density greater than that of water Discuss the method and devices used to remove suspensions with a density lower than that of water Draw and discuss the principle of operation of a lamella settler Discuss the role of activated carbon in sorption processes

What is the water disinfection process? What parameters influence the course and effectiveness of this process? Briefly discuss one selected method.

Discuss the flotation process used in water purification processes

Discuss the ion exchange process used in water purification processes. What are the stages of this process and what parameters affect its effectiveness.

Explain the differences between the composition of municipal and industrial wastewater

What is the purpose of wastewater treatment? Classification of sewage treatment plants

Discuss the mechanical methods used to treat wastewater

Discuss biological methods used to treat wastewater

Describe the principle of operation of an SBR reactor

What are biological deposits? When do we use them? What are their advantages and disadvantages?

Explain the difference between activated sludge and biological deposits.

Discuss one selected method of advanced oxidation of pollutants. Where do we use AOP methods?

What are sewage sludges and how are they formed? Discuss the chemical composition of sewage sludge

Briefly discuss the properties of sewage sludge

List and briefly discuss the methods of sewage sludge management in Poland

How to reduce the volume of sewage sludge. Briefly discuss known methods.

Discuss the equipment used for drying sewage sludge

Discuss the process of composting sewage sludge

Explain what the process of sewage sludge hygienization is. List and discuss the methods used for sludge hygienization.

Explain the process of stabilizing sewage sludge. List and discuss the methods used to stabilize sediments.

Discuss the process of sewage sludge incineration

Explain the process of dephosphatation, nitrification and denitrification.

Discuss the classification of soil remediation methods. What determines the choice of remediation method for contaminated soil?

List and critically discuss physicochemical methods of soil reclamation used in-situ

Draw an example diagram of an installation for soil cleaning using the vacuum method in in-situ conditions and discuss the process on this basis.

	Draw an example diagram of an installation for soil purification using the chemical oxidation method in in-situ conditions and discuss the process on this basis. Discuss the process of recovering precious metals from waste Characterize municipal waste What are the requirements for modern waste landfills? What determines the choice of location for a waste landfill?
Work placement	Not applicable

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