University of Gdańsk

Subject card

Subject name and code	Technology of the atmosphere protection, PG_00117761						
Field of study	Chemistry						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2024/2025			
Education level	postgraduate 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	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	2.0			
Learning profile	academic		Assessment form				
Conducting unit	Pracownia Fotokatalizy -> Katedra Technologii Środowiska -> Faculty of Chemistry						
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	15.0	0.0	0.0	0.0	0.0	15
	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	15	2.0	33.0	50

Subject objectives	Familiarizing students with all issues mentioned in the lecture program content. To familiarize students with the main stages of the technological process used to remove pollutants from the gas phase To familiarize students with instrumental analysis techniques. Developing the ability to independently perform calculations necessary for the correct interpretation of analysis results Developing the ability to independently select the appropriate technology for removing pollutants from air streams.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.	selects equipment appropriate to specific atmospheric protection pollutants	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W11] Demonstrates general knowledge about the current trends in the development of chemistry as a science and the latest discoveries in this field.	Demonstrates the ability to carry out physicochemical and technological measurements important for the removal of air pollutants	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W04] Applies the acquired knowledge to an in-depth description of the properties of chemical connections, methods of their synthesis and analysis.	Plans and develops atmospheric protection technologies	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	can independently search for additional literature and read it basis to deepen knowledge	[SK5] implementation of a problem task
[CHEMMU2_K03] Understands the need for systematic work on various projects of a long-term nature and knows how to set priorities for the implementation of undertaken tasks.	Plans and develops technologies remediation of contaminated land	[SK1] oral statement/conversation/ discussion [SK5] implementation of a problem task
[CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.	plans experiments based on acquired knowledge	[SU6] demonstration of practical skills

Subject contents

Particle size distribution and dust characteristics. Characteristics of aerosol particles. Physical basis of the gas dedusting process. Air purification and dedusting devices. Dust collectors: cyclone, electrostatic precipitators, vacuum dust collectors, scrubbers. Aerosol removal devices. Removal of gaseous pollutants. Emission control in fermentation plants, chemical plants, refineries and the pulp and paper industry. Removing SO2 from chimney gases. H2S removal and odor control. Removal of CO2 and H2S from gas streams. Removal of organic compounds. emission control of SO2 and NOx. Flue gas desulfurization methods. Adsorption and absorption processes. Thermal and catalytic combustion. Air purification/ deodorization and disinfection processes in closed rooms.

Prerequisites and co-requisites

Assessment methods and criteria

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

Recommended reading

Basic literature	Lewandowski W., Techniczno-technologiczne i aparaturowe aspekty ochrony powietrza, WPG Gdańsk 2011. Konieczyński J., Ochrona powietrza przed szkodliwymi gazami. Metody, aparatura i instalacje. Wydawnictwo Politechniki Gliwickiej, Gliwice 2004. Ciok Z., Ochrona środowiska w elektroenergetyce, PWN Warszawa 2001
Supplementary literature	Kucowski J., Laudyn D., Przekwas M., Energetyka a ochrona środowiska, WNT Warszawa 1997. Warych J., Oczyszczanie gazów. Procesy i aparatura, WNT Warszawa 1998. Warych J., Oczyszczanie przemysłowych gazów odlotowych, WNT Warszawa 1988
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Discuss the classification of atmospheric aerosols (according to size and behavior in the respiratory system) Explain the process of thermal and catalytic oxidation used to remove odors How can self-cleaning surfaces be used to protect the atmosphere? Schematically draw the installation system and discuss the solvent absorption method used to separate CO2 from exhaust gases Draw a diagram and discuss the principle of air dedusting in inertial-impact dust collectors. What main phenomena, processes and forces are used in dedusting devices of this type? Discuss the selected technology for dry flue gas desulfurization Discuss possible solutions used during biological desulfurization of biogas List and briefly discuss methods for reducing sulfur emissions into the atmosphere List and discuss in detail the strategies used and specific examples of technologies that reduce SO2 emissions into the atmosphere List and discuss in detail the strategies used to reduce CO2 emissions into the atmosphere Discuss the principle of operation and devices used for filter dedusting. Discuss the stages of filter dedusting in the dry dedusting process. Discuss the main types and features of filter baffles Discuss the mechanisms of NOx formation in fuel combustion processes Discuss methods for simultaneous removal of NOx and SOx from exhaust gases Discuss biological methods used to remove odors List and briefly discuss the methods of geological CO2 storage List and briefly discuss the methods of removing nitrogen oxides from exhaust gases List and briefly discuss methods of reducing CO2 emissions into the atmosphere Discuss the lime-lime method as an example of the wet method used for flue gas desulfurization Discuss in detail three selected methods of removing sulfur from solid fuels What is thermal desulfurization of crude oil? 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 What properties of coal and impurities can be used to separate a mixture of heterogeneous coal and its impurities into individual components? Draw a diagram of the installation and, based on the drawing, discuss the principle of coal desulfurization using the difference in wettability of coal and pyrite 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 classification of methods used for air dedusting Draw an example diagram of a device used for dedusting dry air and discuss the process on this basis Draw an example diagram of a device used for dedusting wet air and discuss the process on this basis
Work placement	Not applicable

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