



## Subject card

Subject name and code	Air Purification Technologies, PG_00036298						
Field of study	Green Technologies						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Optional subject group 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			Polish		
Semester of study	6	ECTS credits			4.0		
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. Justyna Łuczak					
	Teachers	dr hab. inż. Justyna Łuczak dr hab. inż. Jacek Gębicki dr inż. Piotr Rybarczyk dr hab. inż. Marek Lieder					
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	15.0		40.0	100	
Subject objectives	Acquiring knowledge about basic technologies of air protection and purification						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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	The student knows the basic methods of air purification and operates basic installations used for this purpose. Student is able to propose a method of purification of air containing selected pollutants.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[K6_U03] is able to use information and communication technologies relevant to the common tasks of engineering, is able to use known methods and mathematical-physical models to describe and explain phenomena and chemical processes	The student uses databases and e-platforms to search for information on methods and technologies for air purification.	[SU4] Assessment of ability to use methods and tools
	[K6_U05] can formulate and solve engineering tasks analytical methods, simulation as well as experimental, able to apply knowledge of basic physics and mathematics to analyze the results of experiments, is able to analyze and assess existing technical solutions	The student is able to evaluate existing technical solutions	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	[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 knows the basic air pollutants, their characteristics and basic sources of emissions. The student knows the basic methods of removing pollutants from gas streams.	[SW2] Assessment of knowledge contained in presentation
Subject contents	The main pollutants of the atmosphere. General principles of dust control. Dust removal methods for air (dry and wet). Primary and secondary methods of reducing NOx emissions. Air protection by desulfurization of fossil fuels. Flue gas desulfurization. Treatment of waste gases from VOCs. Control of odor emissions. Control of CO2 emissions. Photocatalytic methods of air purification.		
Prerequisites and co-requisites	Environmental chemistry  Physical chemistry  Basics of chemical technology  Process engineering		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Participation and activity in laboratory classes	55.0%	40.0%
	Exam	55.0%	60.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>Lewandowski W., Techniczno-technologiczne i aparaturowe aspekty ochrony powietrza, WPG Gdańsk 2011;</li> <li>Warych J., Oczyszczanie gazów. Procesy i aparatura, WNT Warszawa 1998;</li> <li>Warych J., Oczyszczanie przemysłowych gazów odlotowych, WNT Warszawa 1988;</li> <li>Juda J., Nowicki M., Urządzenia odpylające, PWN, Warszawa 1979;</li> <li>Koniecznyński J., Ochrona powietrza przed szkodliwymi gazami. Metody, aparatura i instalacje, WPS, Gliwice 2004;</li> <li>Kośmider, J., Mazur-Chrzanowska, B., Wyszyński, B., Odory, Wyd. 1, PWN, Warszawa 2002;</li> </ul>	

	Supplementary literature	<ul style="list-style-type: none"> <li>• Krajowy bilans emisji SO<sub>2</sub>, NO<sub>x</sub>, CO, NH<sub>3</sub>, NMLZO, pyłów, metali ciężkich i TZO za lata 1990-2019, Raport syntetyczny, Krajowy Ośrodek Inwentaryzacji i Raportowania Emisji, Instytut Ochrony Środowiska Państwowy Instytut Badawczy, Warszawa 2021;</li> <li>• Krajowy Raport Inwentaryzacyjny 2021, Inwentaryzacja gazów cieplarnianych dla lat 1988-2019, Raport syntetyczny, Krajowy Ośrodek Bilansowania i Zarządzania Emisjami (KOBiZE), Instytut Ochrony Środowiska Państwowy Instytut Badawczy, , Warszawa 2021.</li> <li>• Rozporządzenie Ministra Środowiska z dnia 26 stycznia 2010 r. w sprawie wartości odniesienia dla niektórych substancji w powietrzu, Dz.U. 2010 nr 16 poz. 87</li> </ul>
Example issues/ example questions/ tasks being completed	eResources addresses	Adresy na platformie eNauczanie:
		<p>1. Draw a diagram and on its basis describe selective catalytic reduction of NO<sub>x</sub> contained in flue gases, consider reactions occurring in the process and limitations of this method.</p> <p>2. Discuss the most important strategies related with reducing CO<sub>2</sub> emissions to the atmosphere. Draw the installation diagram and on this basis discuss the chosen process of CO<sub>2</sub> separation from flue gases and CO<sub>2</sub> storage.</p>
Work placement		Not applicable