



Subject card

Subject name and code	, PG_00048771						
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			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			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Colloid and Lipid Science -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Christian Jungnickel				
	Teachers		dr hab. Christian Jungnickel				
Lesson types and methods of instruction	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 Additional information: https://enauzanie.pg.edu.pl/moodle/course/view.php?id=29658						
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	2.0		18.0	50	
Subject objectives	The lectures series will focus on the principles of inorganic chemical processes and chemical technologies, and their associated environmental/green issues. The series will outline in each lecture a new chemical process and discuss environmental and green issues.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U04] capable of formulating and solving design tasks in the field of environmental technology to recognize their non-technical aspects, including environmental, economic and legal. Is capable of applying the principles of occupational health and safety. Is able to make initial assessment of engineering solutions and actions	The risk of each chemical technology and process will be analyzed. And for each, the student will learn to recognize the occupational health and safety risks, where applicable. The student will then propose greener alternatives.			[SU2] Assessment of ability to analyse information		
	[K6_W02] has a basic knowledge of chemistry including general chemistry, inorganic, organic, physical, analytical, including the knowledge necessary to describe and understand the phenomena and chemical processes occurring in the environment; measurement and the determination of the parameters of these processes.	The student will analyze a variety of chemical technologies and processes, and in each case will learn the environmental distribution and effect on man and mankind. For each, a green alternative will be discussed.			[SW3] Assessment of knowledge contained in written work and projects		
Subject contents	The lecture will focus on inorganic chemical process design, and ecological aspects of these processes. The lectures series will start with a discussion on the principles of green chemistry and green engineering. Other issues will include risk assessment, and environmental fate analysis, inorganic chemical process design and development. Working without organic solvents. Principles of particle size reduction and flotation. Solid catalysts, their function, and application. Solid acids and bases. Agrochemicals and Manufacturing of fertilizer - alternative agriculture. Metallurgy and heavy metals, including lead, zinc and iron smelting. Separation techniques in chemical and environmental technology. Surface chemistry and its importance in chemical and environmental technology. Green nanoparticles, and their synthesis. Landfill design, and optimization.						

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test 1	50.0%	50.0%
	Test 2	50.0%	50.0%
Recommended reading	Basic literature	<p>Albert S. Matlak, Introduction to Green Chemistry, Marcel Dekker, New York, 2001</p> <p>Perosa, A., & Zecchini, F. (2007). <i>Methods and reagents for green chemistry: an introduction</i> . John Wiley & Sons.</p> <p>Davim, J. Paulo, ed. <i>Green manufacturing processes and systems</i> . Berlin: Springer, 2013.</p> <p>Rothenberg, G. (2017). <i>Catalysis: concepts and green applications</i> . John Wiley & Sons.</p>	
	Supplementary literature	<p>Booker, JR, Brachman, R., Quigley, RM, & Rowe, RK (2004). <i>Barrier systems for waste disposal facilities</i> . Crc Press.</p> <p>Judd, S. (2010). <i>The MBR book: principles and applications of membrane bioreactors for water and wastewater treatment</i> . Elsevier.</p>	
	eResources addresses	<p>Adresy na platformie eNauzanie: Green Inorganic Technologies - 2022/23 - Moodle ID: 29658 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=29658</p>	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> • Water content of a soil has a significant influence on the distribution of fertilizer / contaminants. Why? • How to determine the fate of a chemical in the environment? • What are the differences between Langmuir and Freundlich isotherm? 		
Work placement	Not applicable		