



## Subject card

Subject name and code	Inorganic technology, PG_00035977						
Field of study	Chemical Technology						
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			Polish		
Semester of study	6	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Lieder					
	Teachers	dr hab. inż. Marek Lieder dr hab. inż. Justyna Łuczak					
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	15.0	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		5.0		25.0	75
Subject objectives	Student learns practical aspects of technological processes in chemical industry. Student can apply theoretical knowledge to technology.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W05	Student acquires knowledge in the field of inorganic technology, especially for the production of inorganic acids like phosphoric, sulphuric, nitric and also fertilizers, ammonia, sodium hydroxide, chlorine and hydrogen.			[SW1] Assessment of factual knowledge		
	K6_U03	Student knows and understands physico-chemical basis of inorganic technologies. Understands the importance of fundamental operation and process units.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information		
	K6_U11	Student acquires further education through self-study			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
	K6_U13	Student is competent at economic aspects of projecting new technical and technological solutions.			[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>1. Technology of soda ash</p> <p>2. Production of sulphuric acid</p> <p>3. Technology of phosphorus, inorganic compounds of phosphorus and phosphates.</p> <p>4. Technology of inorganic compounds of nitrogen - synthesis of ammonia, nitric acid and urea.</p> <p>5. Technology of combustion and energy conversion</p> <p>6. Technology of chlorine production</p> <p>7. Technology of water treatment for industry and consumption.</p> <p>8. Metallurgical processes</p> <p>9. The hydrogen economy.</p>											
Prerequisites and co-requisites	Basics of Chemical technology. Introductory level.											
Assessment methods and criteria	<table border="1" data-bbox="448 860 1487 965"> <thead> <tr> <th data-bbox="448 860 794 898">Subject passing criteria</th> <th data-bbox="794 860 1141 898">Passing threshold</th> <th data-bbox="1141 860 1487 898">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 898 794 931">written exam</td> <td data-bbox="794 898 1141 931">60.0%</td> <td data-bbox="1141 898 1487 931">60.0%</td> </tr> <tr> <td data-bbox="448 931 794 965">midterm colloquiums</td> <td data-bbox="794 931 1141 965">60.0%</td> <td data-bbox="1141 931 1487 965">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	written exam	60.0%	60.0%	midterm colloquiums	60.0%	40.0%
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written exam	60.0%	60.0%										
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Recommended reading	Basic literature	<p>1. Bortel E., Koneczny H. Zarys technologii chemicznej Wydawnictwo Naukowe PWN Warszawa 1992 2. Kępiński J. Technologia chemiczna nieorganiczna Państwowe Wydawnictwo Naukowe Warszawa 1984 3. Schmidt-Szałowski K., Sentek J. Podstawy technologii chemicznej. Organizacja procesów produkcyjnych Oficyna Wydawnicza Politechniki Warszawskiej Warszawa 2001 4. Schmidt-Szałowski K., Sentek J., Raabe J., Bobryk E. Podstawy technologii chemicznej. Procesy w przemyśle nieorganicznym Oficyna Wydawnicza Politechniki Warszawskiej Warszawa 2004 5. Praca zbiorowa pod redakcją K. Schmidt-Szałowskiego Podstawy technologii chemicznej. Bilanse procesów technologicznych Oficyna Wydawnicza Politechniki Warszawskiej Warszawa 1997 6. Kowalski W., Nowe kierunki w technologii kwasu siarkowego, WNT Warszawa 1980</p>										
	Supplementary literature	<p>M. Jia and J. Wang, Review and comparison of various hydrogen production methods based on costs and life cycle impact assessment indicators, Int. J. Hydrogen Energy, 2021, 46, 38612–38635.</p>										
	eResources addresses	<p>Adresy na platformie eNauczanie:  Technologia Nieorganiczna - Wykład - 2022/2023 - Moodle ID: 25918  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25918">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25918</a></p>										

<p>Example issues/ example questions/ tasks being completed</p>	<p>1. Explain why coke is considered to be a 'dirty' (unecological) fuel , but methane is not.</p> <p>2. Inside an instalation for bicarbonate production circulate three gases. What's their role, and how they enter the system?</p> <p>3. We need nitrogen and hydrogen (synthetic gas) for ammonia production. How is hydrogen produced? Are there any chemical reactions involved during hydrogen mixing with nitrogen?</p> <p>4. Is there any alkalization of the electrolyte during chlorine production by mercury electrolysis? Explain</p> <p>5. Both technologies for phosphoric acid production employ recirculation of the acid. Why?</p> <p>6. Nitric acid production:</p> <p>a) write three reaction of ammonia combustion</p> <p>b) why do we use the 11% concentration of ammonia with the air</p> <p>c) what a catalyst is employed? Are there any support for the catalyst?</p> <p>e) Which instalation is better (more efficient): the one operating at low or high pressure? Explain.</p>
<p>Work placement</p>	<p>Not applicable</p>