



Subject card

Subject name and code	, PG_00059021						
Field of study	Nanotechnology						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2023/2024		
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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jarosław Chojnacki					
	Teachers	dr inż. Anna Ordyszewska dr hab. Katarzyna Kazimierczuk prof. dr hab. inż. Jarosław Chojnacki					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
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	60	5.0		60.0		125
Subject objectives	The lecture and laboratory experiments are aimed at demonstration on selected examples how the properties of the elements and their compounds including coordination compounds can be traced in nature and used in man-made products.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W05	Student knows the properties of the elements, the influence of structure on these properties and their importance in everyday life. He gives examples of importance of coordination compounds in chemistry including chemistry of nanomaterials. Appreciates the global (or local) effects that are the result of uncontrolled introduction into the environment of certain chemicals (ozone, CO ₂ , freons, SO _x). He knows the chemical basis for obtaining and modifying materials important in nanotechnology (aerogels, xerogels etc.).			[SW1] Assessment of factual knowledge		
	K6_U01	The student knows how to obtain information from literature and other sources on a given topic, especially related to the laboratory task performed.			[SU1] Assessment of task fulfilment		
	K6_U04	Student can perform basic experiments in a chemical laboratory. He prepares reliable reports on the experiments carried out.			[SU1] Assessment of task fulfilment		

Subject contents	<p>Lecture:</p> <ol style="list-style-type: none"> 1. Chemical bonds and interactions. Crystals. Colour and photonic crystals. 2. Blue paint pigments - their history and present day, types. 3. Silicates, Silica aerogels. Natural microsilica structures - diatoms. 4. Silicones - genesis, structure, preparation, properties and use. 5. Oxygen. Ionic oxides, peroxides and superoxides - structure, properties and use. 6. Ozone and its role in troposphere and stratosphere. Acid rain effects. 7. Different forms of elements - from mono- to polyatomic species. Phosphorus allotropy. 8. Covalent oxides - nitrogen oxides in nature and technology. 9. Properties of d- and f-block of elements. Coordination compounds. 10. Acids, polyacids and their salts. 11. Coordination polymers and MOF's. 12. Introduction to supramolecular chemistry. 13. Two lectures based on actual science findings and relevant literature data. "Hot" topics. <p>Laboratory experiments (subjects):</p> <ol style="list-style-type: none"> 1. Redox reactions 2. Coordination compounds 3. Qualitative analysis of selected ions 4. Chemical route to the "nanoworld" 5. Acid-base properties of chemical compounds 6. Selected aspects of crystallization 											
Prerequisites and co-requisites	"General and Inorganic Chemistry" sem I and "Basics of Organic and Physical Chemistry" sem II, passed											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 871 794 898">Subject passing criteria</th> <th data-bbox="799 871 1137 898">Passing threshold</th> <th data-bbox="1142 871 1471 898">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 904 794 931">lecture: written test</td> <td data-bbox="799 904 1137 931">60.0%</td> <td data-bbox="1142 904 1471 931">50.0%</td> </tr> <tr> <td data-bbox="456 938 794 987">introductory tests and detailed reports</td> <td data-bbox="799 938 1137 987">50.0%</td> <td data-bbox="1142 938 1471 987">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	lecture: written test	60.0%	50.0%	introductory tests and detailed reports	50.0%	50.0%
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Example issues/ example questions/ tasks being completed	<p>Lecture test - selected examples:</p> <ol style="list-style-type: none"> 1. Give the electronic configuration of O_2^{2-} using LCAO method. 2. Explain the influence of Si/Al ratio on properties of zeolites. 3. What is the role of chlorine in the ozone hole formation? 4. Helium - its sources and use. 5. What is the ozone role in the troposphere (the layer close to the earth surface)? 6. Which elements form covalent oxides? How these oxides usually react with water? 7. Characterize silicates. 8. Describe the properties and use of a selected nitrogen oxide. 9. Why there is one type of $ZnCl_2(NH_3)_2$ and two types of $PtCl_2(NH_3)_2$? <p>Short laboratory test questions are closely related to the appropriate exercise topics.</p>											
Work placement	Not applicable											