



## Subject card

Subject name and code	Environment protection, PG_00020943						
Field of study	Nanotechnology						
Date of commencement of studies	October 2023	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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			1.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Elektrochemii i Fizykochemii Powierzchni -> Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Ryl					
	Teachers	dr hab. inż. Jacek Ryl					
Lesson types and methods of instruction	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	1.0		9.0	25	
Subject objectives	Make students aware of the impact of human productive activity on the natural environment. Overview of the principles of sustainable development. Presentation of the role of engineers in developing tools and technologies allowing for more effective environment protection.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_K71] is conscious of the need to apply knowledge from humanistic, social, economic or legal sciences in order to function in a social environment	the student understands the role of engineering and modern technologies to ensure sustainable development			[SK5] Assessment of ability to solve problems that arise in practice		
	K6_U10	The student is aware of the impact of nanomaterials on the environment at every stage of the life cycle			[SU5] Assessment of ability to present the results of task		
Subject contents	<p>Human impact on the environment. Types and sources of water, soil and air pollution. Circulation of resources in the environment. Global, local and point environmental threats. Evolution of environmental protection. Environmental protection strategies: conservative, technological and planning. The idea of sustainable development. The role of material engineers in shaping changes, designing materials and technological processes. Available sources of energy, their harmfulness to the natural environment, materials and technologies related to obtaining energy, energy efficiency of processes. Maximizing the efficiency of using energy, time, mass and space. Principles of green chemistry, toxicity and biodegradability of materials, Protection against corrosion. Circular economy. Recycling. Process automation (drivers, management systems, monitoring).</p>						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Writing test	60.0%	60.0%
	oral presentation	60.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. J. Krystek, Ochrona środowiska dla inżynierów, PWN 2018</li> <li>2. M. Popkiewicz i inni, Nauka o klimacie, Wydawnictwo Nieoczywiste, 2019</li> <li>3. W. Adamczyk; Ekologia wyrobów; PWE 2004</li> <li>4. Z. Kowalski, J. Kulczyńska, M. Góralczyk; Ekologiczna ocena cyklu życia procesów wytwórczych (LCA), PWN 2007</li> <li>5. K. Małachowski; Gospodarka a środowisko i ekologia, CeDeWu, 2011</li> <li>6. Z. Wnuk; Ekologia i ochrona środowiska. Wybrane zagadnienia., Wydawnictwo Uniwersytetu Rzeszowskiego, 2011</li> </ol>	
	Supplementary literature	JCR articles	
	eResources addresses	Adresy na platformie eNauczenie: Ochrona Środowiska 23/24 - Moodle ID: 30873 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30873">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30873</a>	
Example issues/ example questions/ tasks being completed	<p>The life cycle of the selected product.</p> <p>Types of impacts on the environment at the stage of manufacture of the selected material.</p> <p>The use of ecodesign principles on the example of the selected product.</p>		
Work placement	Not applicable		