


**KAPITAŁ LUDZKI**  
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez  
 Unię Europejską w ramach  
 Europejskiego Funduszu  
 Społecznego

**UNIA EUROPEJSKA**  
 EUROPEJSKI  
 FUNDUSZ SPOŁECZNY


<b>Course title</b>		<b>ECTS code</b>	
Advanced processes in environment protection		13.3.1212	
<b>Name of unit administrating study</b>			
null			
<b>Studies</b>			
<b>faculty</b>	<b>field of study</b>	<b>type</b>	second tier studies (MA)
Faculty of Chemistry	Chemical Business	<b>form</b>	full-time
		<b>specialty</b>	all
		<b>specialization</b>	all
Faculty of Chemistry	Chemistry	<b>type</b>	second tier studies (MA)
		<b>form</b>	full-time
		<b>specialty</b>	all
Faculty of Chemistry	Environmental Protection	<b>specialization</b>	all
		<b>type</b>	second tier studies (MA)
		<b>form</b>	full-time
		<b>specialty</b>	all
		<b>specialization</b>	all
<b>Teaching staff</b>			
prof. dr hab. Ewa Siedlecka			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b>	
<b>Forms of classes</b>		4	
Laboratory classes, Lecture		Lecture – 10h	
<b>The realization of activities</b>		Laboratory classes – 20 h	
classroom instruction		tutorial classes – 5 h	
<b>Number of hours</b>		student's work – 65 h	
Lecture: 10 hours, Laboratory classes: 20 hours		Total – 100 h – 4 ECTS	
<b>The academic cycle</b>			
2023/2024 winter semester			
<b>Type of course</b>		<b>Language of instruction</b>	
an elective course		english	
<b>Teaching methods</b>		<b>Form and method of assessment and basic criteria for evaluation or examination requirements</b>	
<ul style="list-style-type: none"> <li>- chemical experiments, analysis of obtained results, presentation and discussion</li> <li>- multimedia-based lecture</li> </ul>		<b>Final evaluation</b>	
		Graded credit	
		<b>Assessment methods</b>	
		exam with open and closed questions	
		<b>The basic criteria for evaluation</b>	
		Lecture: a positive note from an exam with open and closed questions, positive note from the laboratory classes	
		Laboratory classes: a positive note from all reports and its presentation	
		91-100%: 5.0	
		81-90%: 4.5	
		71-80%: 4.0	
		61-70%: 3.5	
		51-60%: 3.0	
		< 51%: 2.0	
<b>Method of verifying required learning outcomes</b>			
<b>Required courses and introductory requirements</b>			
A. Formal requirements			

lack	
<b>B. Prerequisites</b>	
lack	
<b>Aims of education</b>	
<p>presenting fundamental issues connected with advanced processes applied in synthesis</p> <p>introducing basic issues related to advanced processes involved in environmental protection</p> <p>familiarise students with aspects of water treatment and waste disposal methods</p> <p>familiarise students with the commonly used experimental methods and data processing</p>	
<b>Course contents</b>	
<p>Advanced processes in the synthesis: production of fuels and polymers from waste as technologies ensuring sustainable development of society, synthesis of biodegradable materials, selective synthesis assisted by electromagnetic radiation. Advanced processes in environmental protection: water treatment, water disinfection, pharmaceuticals and microplastics removal, application of biological membrane reactors, electrochemical oxidation, and ozonation as a method of removing micropollutants or water disinfection, the Fenton method for the disposal of hazardous waste.</p>	
<b>Bibliography of literature</b>	
<p>Literature required to pass the course</p> <p>instructions for laboratory exercises prepared by the teachers</p> <p>scientific articles indicated by the teachers</p>	
<b>The learning outcomes (for the field of study and specialization)</b>	<b>Chemical Business:</b>
	<p>K_BChII_W01 knows and understands in-depth complex physicochemical processes and is able to analyse their course in connection with other fields of science</p> <p>K_BChII_W06 knows and understands tasks in the field of chemistry, environmental protection and economics that are the subject of human activity to a degree that allows independent work on a research, scientific and measurement position</p> <p>K_BChII_U03 is able to present, based on the current state of knowledge, scientific discoveries and the results of own research in the field of chemical and economic sciences, through skilful debate and public speeches</p> <p>K_BChII_U05 is able to choose and apply, based on the literature achievements of chemical sciences in Polish and English, appropriate methods and tools to solve problems in chemistry and related sciences</p> <p>K_BChII_K03 is willing to critically assess the level of his/her own knowledge in the light of the achievements of the studied scientific discipline</p>
	<b>Chemistry:</b>
	<p>K_W07 selects experimental and theoretical techniques to the extent necessary to understand the description and modelling of extended complexity chemical processes</p> <p>K_W11 demonstrates in-depth knowledge about the current trends in the development of chemistry as a science and the latest discoveries in this field</p> <p>K_U01 plans and implements chemical experiments of extended complexity</p> <p>K_U06 presents the results of scientific discoveries in chemistry and related disciplines in an understandable way</p> <p>K_K01 knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so</p>
	<b>Knowledge</b>
	<p>Students: describing fundamental issues connected with advanced processes applied in synthesis and industrial production; classifying advanced processes involved in environmental protection; describing advanced processes of water and waste treatment</p>
	<b>Skills</b>
	<p>Students: propose the solutions to environmental problems connected with anthropogenic pollutants reduction; present plainly – in both speech and writing – correct chemical argumentation; present and explain advanced environmental protection processes, interpret and analyse information connected with environmental protection; explain relations between the environment pollution and proposed treatment method; explains the course of various phenomena occurring in the environment with the use of chemical knowledge in correlation with other sciences;</p>
	<b>Social competence</b>
	<p>Students: understand the need for learning, inspire others for learning; cooperate in a group, taking different roles; exhibit creativity in the determination of priorities necessary for the realisation of various tasks; understand social aspects of practical use of knowledge and abilities as well as connected with their responsibility</p>
	<b>Environmental Protection:</b>
	<p>K_OŚII_W03 characterises the effects of human</p>

<p>interference in the natural environment and explains the mechanisms of reaction of living organisms to its pollution</p> <p>K_OŚII_W05 describes in an in-depth manner development directions and the latest discoveries in the field of scientific disciplines related to environmental protection</p> <p>K_OŚII_U01 on the basis of the acquired knowledge, proposes to solve environmental problems</p> <p>K_OŚII_U03 plans and performs research tasks in the field or laboratory and interprets research results on environmental issues (working individually or in a team assuming various roles, including managerial functions)</p> <p>K_OŚII_K02 recognises threats, creates safe work conditions and is responsible for the safety of own and other people's work</p> <p>K_OŚII_K06 recognises the importance of knowledge in solving encountered cognitive and practical problems and consults experts in the event of difficulties in solving a problem on her/his own</p>	
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