


**KAPITAŁ LUDZKI**  
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez  
 Unię Europejską w ramach  
 Europejskiego Funduszu  
 Społecznego

**UNIA EUROPEJSKA**  
 EUROPEJSKI  
 FUNDUSZ SPOŁECZNY


<b>Nazwa przedmiotu</b>		<b>Kod ECTS</b>	
Advanced processes in environment protection		13.3.1212	
<b>Nazwa jednostki prowadzącej przedmiot</b>			
Katedra Chemii Ogólnej i Nieorganicznej			
<b>Studia</b>			
<b>wydział</b>	<b>kierunek</b>	<b>poziom</b>	<b>drugiego stopnia</b>
Wydział Chemii	Biznes chemiczny	forma	stacjonarne
		moduł specjalnościowy	wszystkie
		specjalizacja	wszystkie
Wydział Chemii	Chemia	poziom	drugiego stopnia
		forma	stacjonarne
		moduł specjalnościowy	wszystkie
Wydział Chemii	Ochrona środowiska	specjalizacja	wszystkie
		poziom	drugiego stopnia
		forma	stacjonarne
Wydział Chemii	Ochrona środowiska	moduł specjalnościowy	wszystkie
		specjalizacja	wszystkie
<b>Nazwisko osoby prowadzącej (osób prowadzących)</b>			
prof. dr hab. Ewa Siedlecka			
<b>Formy zajęć, sposób ich realizacji i przypisana im liczba godzin</b>		<b>Liczba punktów ECTS</b>	
<b>Formy zajęć</b>		4	
Wykład, Ćw. laboratoryjne		Lecture – 10h	
<b>Sposób realizacji zajęć</b>		Laboratory classes – 20 h	
zajęcia w sali dydaktycznej		tutorial classes – 5 h	
<b>Liczba godzin</b>		student's work – 65 h	
Ćw. laboratoryjne: 20 godz., Wykład: 10 godz.		Total – 100 h – 4 ECTS	
<b>Termin realizacji przedmiotu</b>			
2023/2024 zimowy			
<b>Status przedmiotu</b>		<b>Język wykładowy</b>	
fakultatywny (do wyboru)		angielski	
<b>Metody dydaktyczne</b>		<b>Forma i sposób zaliczenia oraz podstawowe kryteria oceny lub wymagania egzaminacyjne</b>	
<ul style="list-style-type: none"> <li>- Wykład z prezentacją multimedialną</li> <li>- chemical experiments, analysis of obtained results, presentation and discussion</li> </ul>		<b>Sposób zaliczenia</b>	
		Zaliczenie na ocenę	
		<b>Formy zaliczenia</b>	
		exam with open and closed questions	
		<b>Podstawowe kryteria oceny</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>Sposób weryfikacji założonych efektów uczenia się</b>			

Lecture: a written exam consisting of open questions covering the issues presented during the lectures; students solve problems (oral answer) in the field of lecture subject.

Laboratory classes: written reports during the laboratory exercises, the student solves problems in writing (reports) or oral (oral answer) related to the topic.

The method of verifying the acquisition of skills: Assessment of the student's involvement in discussions on the issues related to the subject. Assessment of independent conducting of chemical experiments by the student. Evaluation of the student's explanation of the course of chemical experiments, assessing the correctness of the analysis of the results, drawing conclusions from the experiments, and preparing reports.

The method of verifying the acquisition of social competencies: Assessment of the student's ability to solve scientific and research problems based on individual and teamwork.

### Określenie przedmiotów wprowadzających wraz z wymogami wstępnymi

#### A. Wymagania formalne

lack

#### B. Wymagania wstępne

lack

### Cele kształcenia

presenting fundamental issues connected with advanced processes applied in synthesis  
introducing basic issues related to advanced processes involved in environmental protection  
familiarise students with aspects of water treatment and waste disposal methods  
familiarise students with the commonly used experimental methods and data processing

### Treści programowe

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.

### Wykaz literatury

Literature required to pass the course  
instructions for laboratory exercises prepared by the teachers  
scientific articles indicated by the teachers

### Kierunkowe efekty uczenia się

#### Chemical Business:

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  
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

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

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

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

#### Chemistry:

K\_W07 selects experimental and theoretical techniques to the extent necessary to understand the description and modelling of extended complexity chemical processes

K\_W11 demonstrates in-depth knowledge about the current trends in the development of chemistry as a science and

### Wiedza

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

### Umiejętności

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;

### Kompetencje społeczne (postawy)

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

the latest discoveries in this field

K\_U01 plans and implements chemical experiments of extended complexity

K\_U06 presents the results of scientific discoveries in chemistry and related disciplines in an understandable way

K\_K01 knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so

**Environmental Protection:**

K\_OŚII\_W03 characterises the effects of human interference in the natural environment and explains the mechanisms of reaction of living organisms to its pollution

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

K\_OŚII\_U01 on the basis of the acquired knowledge, proposes to solve environmental problems

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)

K\_OŚII\_K02 recognises threats, creates safe work conditions and is responsible for the safety of own and other people's work

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

**Kontakt**

[ewa.siedlecka@ug.edu.pl](mailto:ewa.siedlecka@ug.edu.pl)