



## COURSE CARD

### 1. Basic information

Course name in English:	Bio-based materials applications	
Course name in Polish:	Zastosowania materiałów pochodzenia biologicznego	
Number of hours:	15	
Type of course:	Elective course	
Form of course:	lecture	
Code of course:		
Course leader:	Dr inż. Mateusz Samoraj	
Faculty of the course leader:	W3 Faculty of Chemistry	
Email address of the course leader:	mateusz.samoraj@pwr.edu.pl	
Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course):	Architecture and urban planning	<input type="checkbox"/>
	Automation, electronic, electrical engineering and space technologies	<input type="checkbox"/>
	Information and communication technology	<input type="checkbox"/>
	Biomedical engineering	<input checked="" type="checkbox"/>
	Chemical engineering	<input checked="" type="checkbox"/>
	Civil engineering, geodesy and transport	<input type="checkbox"/>
	Materials engineering	<input type="checkbox"/>
	Mechanical engineering	<input checked="" type="checkbox"/>
	Environmental engineering, mining, and energy	<input checked="" type="checkbox"/>
	Mathematics	<input type="checkbox"/>
	Chemical sciences	<input checked="" type="checkbox"/>
	Physical sciences	<input type="checkbox"/>
	Management and quality studies	<input type="checkbox"/>

### 2. Objectives

- C1** To familiarize students with the basics of Bio-based materials applications
- C2** Obtain basic knowledge of the different Bio-based materials production methods
- C3** Obtain basic knowledge of the organisation of the research and development of Bio-based materials
- C4** To introduce the student to practical Bio-based materials examples in the chemical industry
- C5** To introduce the student to new trends in Bio-based materials applications
- C6** To acquaint students with the mission of chemical and biological sciences in the development of modern sustainable agriculture
- C7** To acquaint the students with the organization of the research and development cycle and its role in implementing process and product innovations in the production of agrochemicals
- C8** To acquaint the students with new civilization challenges related to sustainable development, raw materials and energy problems in the chemical industry
- C9** To acquaint the students with the principles and problems of the development of the innovative fertilizer industry in the EU and Poland



### 3. Content

*Detailed information about the course content, including topics and form of classes.*

No.	Topic	Number of hours	Form of classes
1	Raw materials – available sources and processing	2	lecture
2	Bio-based sorbents: water/wastewater treatment and underground water protection, cleaning the exhaust and process gasses and CO <sub>2</sub> removal from energy generation processes	2	lecture
3	Bio-based polymers in environmental protection	2	lecture
4	Sustainable Use of Biochar in Environmental Management	2	lecture
5	Bio-based fertilizers and food additives - Legal Acts and Regulations, classification, methods of production, environmental impact	2	lecture
6	Biostimulants and bioregulators	2	lecture
7	Food additives – classification, methods of production, environmental impact	2	lecture
8	Test	1	test

### 4. Prerequisites

*List of prerequisites relating to knowledge, skills and other competences for course participants.*

1. Basic knowledge of chemical technology and chemical sciences

### 5. Learning outcomes

*List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).*

Symbol	Learning outcome	
	<i>KNOWLEDGE. Doctoral student knows and understands:</i>	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	<input checked="" type="checkbox"/>
SzD_W4	research methodology;	<input type="checkbox"/>
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	<input type="checkbox"/>
SzD_W6	the fundamental dilemmas of modern civilization;	<input checked="" type="checkbox"/>
SzD_W7	the legal and ethical conditions of scientific activity;	<input checked="" type="checkbox"/>
SzD_W8	the economic and other relevant conditions of scientific activity;	<input checked="" type="checkbox"/>
SzD_W9	basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.	<input checked="" type="checkbox"/>



	<i>SKILLS. Doctoral student is able to:</i>	
SzD_U2	use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research hypothesis, - develop research methods, techniques and tools, and use them creatively, - draw conclusions on the basis of scientific research; critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development; transfer the results of scientific activities to the economic and social spheres;	<input checked="" type="checkbox"/>
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	<input type="checkbox"/>
SzD_U4	disseminate research results, including in popular forms;	<input type="checkbox"/>
SzD_U5	initiate debates and participate in a scientific discourse;	<input checked="" type="checkbox"/>
SzD_U6	be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;	<input checked="" type="checkbox"/>
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	<input type="checkbox"/>
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	<input type="checkbox"/>
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	<input type="checkbox"/>
	<i>SOCIAL COMPETENCES. Doctoral student is ready to:</i>	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	<input checked="" type="checkbox"/>
SzD_K4	maintaining and developing the ethos of research and creative environments, including: - carrying out scientific activities in an independent manner, - respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection.	<input type="checkbox"/>

## 6. Evaluation

*Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.*

test

## 7. Teaching methods

*Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.*

Lecture with multimedia presentation, scientific discussion, consultation, student's own work - preparation for test



## 8. Literature

*List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.*

### PRIMARY LITERATURE:

- [1] K.Chojancka, "Biosorption and bioaccumulation" wyd. Nova, New York 2010
- [2] REGULATION (EU) 2019/1009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019
- [3] Samoraj, M., Tuhy, Ł., Chojnacka, K. (2016) Innovative Bio-Products for Agriculture: Innovative Bio-Based Micronutrient Fertilizers, Nova science.

### SECONDARY LITERATURE:

- [1] Scientific and technical journals: Chemical Industry, Chemical, Apparatus and Chemical Engineering.
- [2] Scientific journals: Springer base, Elsevier, John Wiley & Sons
- [3] Fertilizer Europe.com

## 9. Other remarks

*Additional remarks, comments, (e.g., language of the course)*

Language of the course: English