Wrocław University of Science and Technology
Doctoral School

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:	W03INC-SD0106W / CIQ100401W	
Course leader:	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	☐
	Automation, electronic, and electrical engineering	☐
	Information and communication technology	☐
	Biomedical engineering	☒
	Chemical engineering	☒
	Civil engineering and transport	☐
	Mechanical engineering	☒
	Environmental engineering, mining, and energy	☒
	Mathematics	☐
	Chemical sciences	☒
	Physical sciences	☒
	Management and quality studies	☐

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 CO2 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**	
	KNOWLEDGE. Doctoral student knows and understands:	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	☒
SzD_W4	research methodology;	☐
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	☐
SzD_W6	the fundamental dilemmas of modern civilization;	☒
SzD_W7	the legal and ethical conditions of scientific activity;	☒
SzD_W8	the economic and other relevant conditions of scientific activity;	☒
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.	☒
	SKILLS. Doctoral student is able to:	
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;	
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	☐
SzD_U4	disseminate research results, including in popular forms;	☐
SzD_U5	initiate debates and participate in a scientific discourse;	☒
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;	☒
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	☐
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	☐
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	☐
	SOCIAL COMPETENCES. Doctoral student is ready to:	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	☒
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.	☐

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 bioacumulation" wed. 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)