

A COURSE SYLLABUS – DOCTORAL SCHOOL
REGARDING THE QUALIFICATION CYCLE FROM 2024/2025 TO 2028/2029

GENERAL INFORMATION ABOUT COURSE				
Course title	OPTIONAL SPECIALIZED SUBJECT: Bionanomaterials - advances in synthesis and their application			
Name of the unit running the course	Doctoral School at University of Rzeszów			
Type of course (<i>obligatory, optional</i>)	compulsory - optional specialized			
Year and semester of studies	year I, semester II			
Discipline	biotechnology			
Language of Course	Polish/English language			
Name of Course coordinator	dr hab. Małgorzata Kus - Liśkiewicz, prof. UR			
Name of Course lecturer	dr hab. Małgorzata Kus - Liśkiewicz, prof. UR			
Prerequisites	Knowledge of the basics of nanomaterials synthesis, knowledge of the basics of cell functioning and methods of analyzing its metabolism			
BRIEF DESCRIPTION OF COURSE (100-200 words)				
To acquaint the doctoral student with information on the possibilities of producing bionanomaterials. To present their types and the possibility of conducting various functionalization. To discuss the latest developments in the application of bionanomaterials in biotechnology and biomedicine. To familiarize with legal regulations on the use of bionanomaterials.				
COURSE LEARNING OUTCOMES AND METHODS OF EVALUATING LEARNING OUTCOMES				
Learning outcome	The description of the learning outcome defined for the course	Relation to the degree programme outcomes (symbol)	Learning Format (Lectures, classes,...)	Method of assessment of learning outcomes (e.g. test, oral exam, written exam, project,...)
Knowledge (no.)	knows and understands, has knowledge			
EU1	Knows the methods of synthesis and modification of bionanomaterials used in biotechnology and biomedicine.	P8S_WG/1, P8S_WG/2,	lecture and exercises	project
EU2	Knows the procedures and test methodology used to analyze the potential of nanobiomaterial against biological systems.	P8S_WG/3,	lecture and exercises	project
EU3	Knows and understands the threats of civilization to the modern world .	P8S_WK/1	lecture and exercises	project
Skills (no.)	can			
EU4	Able to critically analyze the results of research on the properties of the procedures used in the study of the interactions of bionanomaterials and provide their own opinion.	P8S_UW/2, P8S_UW/1, P8S_UW/3	lecture and exercises	project
EU5	Able to present the latest developments in the field of	P8S_UK/6	lecture and exercises	project

	materials synthesis, and engage in discussion, using English-language literature.					
Social competence (no.)	is ready to					
EU6	He is ready to recognize the importance of the choice and validity of the tests used in the analysis of the interaction of bionanomaterials in in vitro and in vivo systems.		P8S_KK/3	lecture and exercises		project
EU7	He is ready to initiate activities aimed at spreading knowledge about the application of bionanomaterials.		P8S_KK/3	lecture and exercises		project
LEARNING FORMAT – NUMBER OF HOURS						
Semester (no.)	Lectures	Seminars	Lab classes	Internships	others	ECTS
II	-	15 <i>(konwersatoria)</i>	-	-	-	2
METHODS OF INSTRUCTION						
<ul style="list-style-type: none"> - CONVERSATIONS IN THE TRADITIONAL FORM; - CLASSES WITH MULTIMEDIA PRESENTATION; - PROJECT; - DISCUSSION. 						
COURSE CONTENT						
Seminar: <ol style="list-style-type: none"> 1. Development and perspectives of created bionanomaterials and composite materials. 2. Recent developments in synthesis processes and applications. 3. Properties of natural, synthetic composites and their interactions with biological systems. 4. The cell as an indicator of biocompatibility. Cytotoxicity, genotoxicity, immunotoxicity tests. 5. Methodology of in vivo tests used in the analysis of the impact of bionanomaterials. Techniques used to evaluate the materials produced. Standards and regulations on the use of bionanomaterials. 						
COURSE ASSESSMENT CRITERIA						
<p>Conversation classes - the exam is held after semester 2, in the form of a test,</p> <p>evaluation criteria: 65% - 3,0; 75% - 3,5; 85% - 4,0; 90 - 4,5; 95-100% - 5,0.</p> <p>The final grade is obtained after the presentation.</p>						
TOTAL PhD STUDENT WORKLOAD REQUIRED TO ACHIEVE THE INTENDED LEARNING OUTCOMES – NUMBER OF HOURS AND ECTS CREDITS						
Activity				Number of hours		

Scheduled course contact hours	15
Other contact hours involving the teacher (consultation hours, examinations)	1
Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)	34
Total number of hours	50
Total number of ECTS credits	2

INSTRUCTIONAL MATERIALS

Compulsory literature:	<ol style="list-style-type: none"> 1. Michael Giersig and Gennady B. Khomutov, Nanomaterials for application in medicine and biology, Nanotechnologia - materiały konferencyjne, 2008,- Springer 2. J. Marciniak, Biomateriały, Wyd. Politechniki Śląskiej, Gliwice 2013; 3. Adam Mazurkiewicz Biomateriały : laboratorium, Uniwersytet Technologiczno-Przyrodniczy im. Jana i Jędrzeja Śniadeckich (Bydgoszcz); 4. Bikramjit Basu, Dharendra Katti and Ashok Kumar, Advanced biomaterials: fundamentals, processing and applications; 5. Zofia Knychalska-Karwan, Anna Ślósarczyk, Hydroksyapatyt w stomatologii, Kraków : Krakmedia;
Complementary literature:	Aktualne publikacje naukowe

*(1 ECTS CREDIT CORRESPONDS TO 25 - 30 HOURS OF THE TOTAL WORKLOAD OF A DOCTORAL STUDENT, NEEDED TO ACHIEVE THE ESTABLISHED EFFECTS).

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Date and signature of the Course lecturer

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Approved by the Head of the Department or an authorised person