



## COURSE CARD

### 1. Basic information

Course name in English:	Recent research trends in Biomedical Engineering]	
Course name in Polish:	Najnowsze kierunki badań w Inżynierii Biomedycznej]	
Number of hours:	30	
Type of course:	Recent research trends in discipline	
Form of course:	lecture	
Code of course:		
Course leader:	Prof. dr hab. Eng. MD Halina Podbielska	
Faculty of the course leader:	W11 Faculty of Fundamental Problems of Technology	
Email address of the course leader:	halina.podbielska@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 checked="" type="checkbox"/>
	Information and communication technology	<input checked="" 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 checked="" 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 checked="" type="checkbox"/>
	Management and quality studies	<input type="checkbox"/>

### 2. Objectives

The aim of the lecture is to gain knowledge on selected aspects of modern biomedical engineering. The topics concern selected technological and scientific aspects of e.g. immunology, personalized medicine, bioinformatics and medical informatics, e-medicine, biophotonics, nanobiomedicine, artificial intelligence in medical sciences, medicine 4.0, supporting the functions of the human body. The lecture will enable the acquisition, analysis, and synthesis of information on selected methods of biomedical engineering and technical solutions. Classes include interactive lectures by invited guests from national and international institutions followed by discussions.

### 3. Content

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

No.	Topic	Number of hours	Form of classes
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1	Current trends in the field of e-Medicine, Medicine 4.0	2	lecture
2	Technologies in personalized prediction, prevention and medical therapy	2	lecture
3	Eye imaging methods	2	lecture
4	AI aspects of Biomedical Engineering	2	lecture
5	New aspects of optical coherence tomography	2	lecture
6	Proteins studies	2	lecture
7	New trends in bioinformatics		lecture
8	Current trends in immunology	2	lecture
9	Current trends in biomaterials and implants	2	lecture
10	New aspects of interventional cardiology	2	lecture
11	Neural interface technologies	2	lecture
12	Spectroscopic imaging in medical diagnostics	2	lecture
13	Research of the human brain	2	lecture
14	New trends in the development of optical and hybrid imaging techniques in biomedicine	2	lecture
15	Theranostics - a new trend in medicine	2	lecture

#### 4. Prerequisites

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

1. Completed higher education at the master's level in the fields of technology, medicine, biology, chemistry, mathematics, physics
2. Knowledge of the English language at an intermediate level

#### 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	
	<b>KNOWLEDGE. Doctoral student knows and understands:</b>	
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 type="checkbox"/>
SzD_W8	the economic and other relevant conditions of scientific activity;	<input 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 type="checkbox"/>
	<b>SKILLS. Doctoral student is able to:</b>	



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 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 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 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"/>
<b>SOCIAL COMPETENCES. Doctoral student is ready to:</b>		
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	<input 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.*

Preparing the report on chosen topic'

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.*

Multimedia presentations and remote studies

Activating methods of group works

Literature studies, developing written document



## 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.*

Scientific articles from major databases PubMed, WOS, SCOPUS, from leading journals, e.g. Scientific Reports, EPMA Journal, Nature Biomedical Engineering, Nature Biotechnology, ACS Materials Letters, Annual Review of Biomedical Engineering, Bioactive Materials, IEEE Robotics and Automation Letters, Investigative Ophthalmology & Visual Science, ACS Biomaterials-Science & Engineering, Biomedical Optics Express, Acta Ophthalmologica, International Journal of Molecular Sciences  
Other resources other sources indicated by the tutor e.g., patent data bases.

## 9. Other remarks

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

Please, notice that order of the lecturers and the form of classes may vary (be either on-site or remote), depending the invited tutor availability.