

COURSE DESCRIPTION CARD

Course name	Bionics and Biomimetics				
Course type	optional	Course code	SDPB0014	ECTS credits	2
Forms and number of hours	lecture: 10 h project: 10 h	Scientific discipline	biomedical engineering		
Course objectives	<p>Knowledge: Getting to know the innovative design of materials and medical devices with the use of biological inspiration. Presentation of the interaction of biology and technology.</p> <p>Skills: Developing the ability to search for patterns in nature and their use in the field of biomedical engineering in the field of bionics and biomimetics. Ability to design an innovative solution modeled on nature.</p> <p>Social competences: creating the ability to work in a group.</p>				
Course content	<p>The subject of bionics research, its origin and applications. Analysis of biological functions of animals and humans. Strategies and methods of using bionics. Simple models of selected biological systems (cells, tissues) and the generation and propagation of biological signals. Fundamentals of biological mechanics of locomotor organs of selected insects, invertebrates, vertebrates and humans. Grasping organs as models of gripper construction. Biological system as a control system. Applications of bionics in innovative design of materials and devices. Artificial muscles: pneumatic, electric, shape-memory, etc. Sensors: touch, pressure, temperature, nervous system activity signals. Biomimetics in implant design. Biomimetics in the design of medical devices. Bionic organs and prostheses: artificial heart, human upper and lower limbs prostheses.</p>				
Teaching methods	Problem lecture, information lecture, discussion, multimedia presentation, project method				
Assessment method	Lecture: written exam - first term; oral exam - resit date Project: assessment of completed projects, current work progress, discussions and activity in the classroom				
Symbol of learning outcome	Learning outcomes		Reference to the learning outcomes for the field of study for the 8th level of Polish Qualification Framework (PRK)	Methods of assessing the learning outcomes	
LO1	Has structured knowledge in the field of designing materials and devices with the use of bionics and biomimetics		SD_W1	Exam	
LO2	Can present the interactions between the world of technology and the world of nature		SD_U1	Project	
LO3	Can present a concept and design a material / medical device inspired by the world of nature		SD_U1	Project	
LO4	Shows the initiative in creating new ideas and searching for innovative solutions in biomedical engineering		SD_K2	Project	

Student workload (in hours)	
Lecture / classes / project / laboratory / seminar	10 / 10
Consultations	5
The unassisted student work	20
Implementation of project tasks and preparation for and participation in exams/tests	5
Total	50
ECTS credits	2

Basic references	<ol style="list-style-type: none"> 1. Samek A.: Bionics-creative inspiration for engineers. Specialist Agency for Press and Books, 2007. 2. Bar-Cohen J.: Biomimetics: nature based innovation. Boca Raton: CRC Press, 2012. 3. Tkacz E., Borys P.: Bionics. WNT, Warszawa 2006
Supplementary references	<ol style="list-style-type: none"> 1. Doroszewski J., Tarnicki R., Zmysłowski W.: Biosystems. Academic Publishing House "Exit". Warsaw 2005. 2. Piekenbrock P.: Bionics, Vogel Business Media, 2019. 3. Nachtigall W., Wisser A., Bionics by Examples, Springer International Publishing, 2016.
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