

COURSE DESCRIPTION CARD – SPECIMEN

Faculty of Mechanical Engineering									
Field of study	Biomedical Engineering							Degree level and programme type	."
Specialization/ diploma path	"							Study profile	."
Course name	Bionics and biomimetics							Course code	IS-FME-00273S
								Course type	."
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	winter/summer
	10			10				No. of ECTS credits	2
Entry requirements	Materials science								
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 based 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. The biological system as a control system. Applications of bionics in the 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 Project: assessment of project, discussions and activity in the classroom								
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study	
LO1	Has structured knowledge in the field of designing materials and devices with the use of bionics and biomimetics							SD_W1	
LO2	Can present the interactions between the world of technology and the world of nature							SD_U1	

LO3	Can present a concept and design a material / medical device inspired by the world of nature	SD_U1
LO4	Shows the initiative in creating new ideas and searching for innovative solutions in biomedical engineering	SD_K2
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	written exam	L
LO2	written exam, evaluation of project	L, P
LO3	evaluation of project	P
LO4	evaluation of project	P
Student workload (in hours)		No. of hours
Calculation	lecture attendance	10
	project classes attendance	10
	preparation of project	20
	participation in student-teacher sessions	10
	preparation for and participation in exams/tests	5
	TOTAL:	55
Quantitative indicators		HOURS
Student workload – activities that require direct teacher participation		No. of ECTS credits
		30
Student workload – practical activities		30
		1
Basic references	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	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	
Organisational unit conducting the course	Institute of Biomedical Engineering	Date of issuing the programme
Author of the programme	Joanna Mystkowska, PhD (Eng), DSc, Assoc. Prof.	27.03.2024

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work,

S – seminar