COURSE DESCRIPTION CARD – SPECIMEN

<table>
<tr><td colspan="10">Faculty of Mechanical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="6">Biomedical Engineering</td><td>Degree level and programme type</td><td>"-"</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6">"-"</td><td>Study profile</td><td>"-"</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Bionics and biomimetics</td><td>Course code</td><td>IS-FME-00270W</td></tr>
<tr><td>Course type</td><td>"-"</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>winter/summer</td></tr>
<tr><td>10</td><td></td><td></td><td>10</td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>2</td></tr>
<tr><td>Entry requirements</td><td colspan="9">Materials science</td></tr>
<tr><td>Course objectives</td><td colspan="9">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.
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.
Social competences: creating the ability to work in a group.</td></tr>
<tr><td>Course content</td><td colspan="9">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.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Problem lecture, information lecture, discussion, multimedia presentation, project method</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture: written exam
Project: assessment of project, discussions and activity in the classroom</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="7">Has structured knowledge in the field of designing materials and devices with the use of bionics and biomimetics</td><td colspan="2">SD_W1</td></tr>
<tr><td>LO2</td><td colspan="7">Can present the interactions between the world of technology and the world of nature</td><td colspan="2">SD_U1</td></tr>
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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**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	30	1
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