Załącznik nr 2 do Zarządzenia Nr 16/2022 Rektora PB

COURSE DESCRIPTION CARD

<table>
<tr><td colspan="10">Bialystok University of Technology
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>full-time 2nd-cycle studies</td></tr>
<tr><td>Specialisation/ diploma path</td><td colspan="6">Common course</td><td>Study profile</td><td>General academic</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Modelling of anatomical structures</td><td>Course code</td><td>MYIB2S0104</td></tr>
<tr><td>Course type</td><td>compulsory</td></tr>
<tr><td rowspan="2">Forms and number of hours of educational activities</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>1</td></tr>
<tr><td>15</td><td></td><td></td><td></td><td>30</td><td></td><td></td><td>No. of ECTS credits</td><td>3</td></tr>
<tr><td>Entry requirements</td><td colspan="9">--</td></tr>
<tr><td>Course objectives</td><td colspan="9">Familiarizing students with the necessary knowledge on modelling of anatomical structures. Presenting the role of numerical simulations in bioengineering. Acquisition of skills related to the modelling methodology.</td></tr>
<tr><td>Course content</td><td colspan="9">Lecture: Basic concepts of modelling, the importance of numerical methods in bioengineering. Methodology of modelling anatomical objects on the basis of the data from medical imaging, in particular on the basis of the results of a computed tomography (CT). Geometric modelling using surface scanning of anatomical objects. The finite element method in the simulation of anatomical structures. Modelling of boundary conditions for bioengineering issues. Basic models of materials used in bioengineering. Modelling of the human musculoskeletal system using multibody systems dynamics analysis methods.

Specialization workshop: Using methods and specialized software to prepare geometric and material models of anatomical objects on the basis of image data, modelling and numerical analysis of anatomical objects using the finite element method</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Informative and problem-oriented lecture; Specialization workshop exercises using specialist software</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture – a written test
Specialization workshop - evaluation of completed assignments, ongoing progress of work, discussion and activity in class</td></tr>
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Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	concepts related to modelling and understands its role in bioengineering	IB2_W01
LO2	methods of reconstructing the geometry and material structure of anatomical objects using the results of tomographic imaging and surface scanning	IB2_W03
LO3	methodology for modelling the human locomotor system as a multibody system	IB2_W03
	Skills: the graduate is able to	
LO4	use the methodology of reconstructing anatomical objects based on the results of a computed tomography	IB2_U06
LO5	develop models of anatomical objects in accordance with the finite element method	IB2_U06

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	test	L
LO2	test	L
LO3	test	L
LO4	Specialization workshop: evaluation of completed assignments, ongoing progress of work, discussion and activity in class	SW
LO5	Specialization workshop: evaluation of completed assignments, ongoing progress of work, discussion and activity in class	SW

Student workload (in hours)		No. of hours
Calculation	Participation in lectures	**15**
	Participation in the specialization workshop	**30**
	Preparation for passing the lecture	**8**
	Performing the tasks at the specialization workshop	**7**
	Preparation for passing the specialization workshop	**10**
	Participation in consultations	**5**
	TOTAL:	**75**

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	**50**	**2**
Student workload – practical activities	**57**	**2.3**

Basic references	1. De S., Guilak F., Mofrad M.R.K., Computational Modeling in Biomechanics, Springer, 2010 2. Nedoma J., Stehlik J., Mathematical and computational methods in biomechanics of human skeletal systems: an introduction, Wiley, 2011.

	3. de Jalon J.G., Bayo E., Kinematic and Dynamic Simulation of Multibody Systems, Springer-Verlag, 1994 4. Winkler T.: Komputerowo wspomagane projektowanie systemów antropotechnicznych, WNT 2005	
Supplementary references	1. Computer Methods in Biomechanics & Biomedical Engineering, Taylor & Francis (magazine) 2. International Journal for Numerical Methods in Biomedical Engineering, WILEY (magazine) Biomechanics and Modeling in Mechanobiology, Springer (magazine)	
Organisational unit conducting the course	Institute of Biomedical Engineering	**Date of issuing the programme**
Author of the programme	Assoc. Prof. Szczepan Piszczatowski , DSc, Phd, Eng	18.07.2022

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