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 studies
Second cycle</td></tr>
<tr><td>Specialisation/ diploma path</td><td colspan="6">-</td><td>Study profile</td><td>elective</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Fundamentals of Biomechanics</td><td>Course code</td><td></td></tr>
<tr><td>Course type</td><td>elective</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>-</td></tr>
<tr><td>30</td><td></td><td>30</td><td></td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>4</td></tr>
<tr><td>Entry requirements</td><td colspan="9">-</td></tr>
<tr><td>Course objectives</td><td colspan="9">The course aims to familiarize students with fundamentals of mechanical functioning of the living organisms.
Students will gain knowledge about: the fundamental principles of biomechanics; basis of human movement, functioning of the musculoskeletal system, basis of tissue mechanics, computational and experimental methods in biomechanics, basis of orthopaedic implants.</td></tr>
<tr><td>Course content</td><td colspan="9">Lecture: introduction to biomechanics (definition, scope, and interdisciplinary nature of biomechanics); fundamental Principles of Biomechanics (basis of kinematics, statics and dynamics); structure of the musculoskeletal system, muscle contraction, loadings acting in the musculoskeletal system, bone and cartilage mechanics; human locomotion; biomechanics of the main anatomical structures: spine, hip and knee joints, ankle and foot, shoulder and elbow joints; basis of orthopaedic implant design (spine stabilizers, cages, joint endoprostheses); modelling and numerical simulation in biomechanics (reconstruction of the anatomical objects, multibody modelling, finite element simulation).
Laboratory classes: measurement of the basic gait parameters and electromyography (Biometrics), motion capture (Qualisys), muscle torques measurement in isometric and isokinetic conditions (Biodex), ground reaction force measurement (Kistler), pedobarography (RsScan)</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Informative-problem lecture;
Laboratory classes: exercises and measurements using specialized equipment, solving practical problems in groups</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture: exam.
Laboratory classes: evaluation of entry tests, reports, discussions and activity in the course.</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	structure and functioning of the musculoskeletal system and its main elements	IB1_W05
LO2	the basic description of the human locomotion	IB1_W05
LO3	fundamentals of skeletal tissue mechanical properties	IB1_W01
LO4	basis of orthopaedic implant design	IB1_W05
	Skills: the graduate is able to	
LO5	perform basic measurement in biomechanics	IB1_U04
Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	Exam	L
LO2	Exam	L
LO3	Exam	L
LO4	Exam	L
LO5	evaluation of entry tests, reports, discussions and activity in the course	LC

Student workload (in hours)		**No. of hours**
Calculation	Participation in lectures	30
	Participation in laboratory classes	30
	Preparation for the lecture assessment	5
	Preparation for laboratory classes entry tests	15
	Completion of laboratory classes reports	15
	Participation in consultations	5
	TOTAL:	**100**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	**65**	**2,6**
Student workload – practical activities	**65**	**2,6**

Basic references	1. Hamil J., Knutzen K.M., Derrick T.R.: Biomechanical Basis of Human Movement, Wolters Kluwer, 2015, 2. Ozkaya N., Nordin M., Goldsheyder D., Leger D.: Fundamental of Biomechanics, Springer, 2017, 3. Michael W. Whittle, Gait Analysis, An Introduction, Elsevier 2007. 4. Kapandji I.A., Physiology of the Joints, Churchill Livingstone, 2016; Handspring Publishing 2019
Supplementary references	1. Ethier C.R., Simmons C.A.: Introductory Biomechanics, From Cells to Organisms, Cambridge University Press, 2007 2. Cowin S.C., Doty S.B., Tissue Mechanics, Springer, 2007 3. Krukemeyer M.G., Mollenho G. (red), Endoprosthetics, An Introduction for the Practitioner, Walter de Gruyter GmbH, Berlin/Boston, 2014.

Organisational unit conducting the course	Institute of Biomedical Engineering	**Date of issuing the programme**
Author of the programme	Assoc. Prof. Eng. Szczepan Piszczatowski	4.03.2025

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