



Subject card

Subject name and code	Engineering biomechanics II, PG_00033002						
Field of study	Medical and Mechanical Engineering, Medical and Mechanical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish Not considered		
Semester of study	4	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Wiktoria Wojnicz				
	Teachers		dr hab. inż. Wiktoria Wojnicz mgr inż. Katarzyna Pytka				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Biomechanika inżynierska, Wykład, IMM, letni 2021-2022 (M:03516W2) - Moodle ID: 21665 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=21665						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		5.0		40.0	75
Subject objectives	The aim of this subject is to acquire knowledge about the human body biomechanics.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U05		A student can formulate a biomechanical model, define input and output data, specify which engineering tools should be used to solve the given problem		[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		
	K6_W05		A student can formulate a biomechanical problem and the method of solving this problem by using fundamentals of mechanics, strength of materials, biomechanics and modelling of mechanical system		[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		

Subject contents	<p>Lectures (DSc PhD W.Wojnicz) (15h)</p> <ol style="list-style-type: none"> 1. Biomechanics and clinical biomechanics. Principles of mechanics used to describe the activity of the human body. Mobility of biokinematic chain. 2. Reference systems used in biomechanics. Standard anatomical position. Types of human motions. Fundamentals of estimation of position of centre of human body mass (de Levas method). 3. Biomechanics of muscle. Biomechanics of muscles system. 4. Principles of electromyography measurement. 5. Biomechanics of bone. Modelling of adaptation remodelling phenomenon of bone tissue. Methods of modelling of bone functional adaptation. Cantilevers of skeletal system. 6. Biomechanics of chondral tissue. Biomechanics of joints. 7. Reflex functioning of nervous system. Principals of movement coordination. 8. Biomechanics of hip joint. Models of hip joint load. Problems of hip joint biomechanics. Alloplastic reconstruction of hip joint. 9. Biomechanics of knee joint. Kinematics of knee joint. Fundamental problem of knee joint biomechanics. Alloplastic reconstruction of knee joint. 10. Biomechanics of glenohumeral joint. Alloplastic reconstruction of glenohumeral joint. Biomechanics of elbow joint. Alloplastic reconstruction of elbow joint. 11. Anatomy of spine. Defects of postures and scoliosis. Methods of spine testing. Biomechanics of spine. Systems of spine stabilization. 12. Osteosynthesis. Stabilizers used to stable osteosynthesis. Mechanical properties of stabilizers used to stable osteosynthesis. Types of stabilizers used to stable osteosynthesis. <p>Tutorials (MSc Katarzyna Forysiak) (15h)</p> <ol style="list-style-type: none"> 1. Assessment of mobility of biokinematic chain (1h). 2. Estimation of position of centre of human body mass (3h). 3. Muscle system biomechanics: static optimization task (2h). 4. Estimation of moments of inertia of the human body parts (1.5h). 5. Dynamic biomechanical models (3.5h). 6. Test (2h). 7. Repeat test (2h). 											
Prerequisites and co-requisites	Knowledge of mathematics, mechanics and strength of materials											
Assessment methods and criteria	<table border="1" data-bbox="448 1093 1487 1205"> <thead> <tr> <th data-bbox="448 1093 794 1137">Subject passing criteria</th> <th data-bbox="794 1093 1141 1137">Passing threshold</th> <th data-bbox="1141 1093 1487 1137">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1137 794 1171">pass of lectures</td> <td data-bbox="794 1137 1141 1171">50.0%</td> <td data-bbox="1141 1137 1487 1171">50.0%</td> </tr> <tr> <td data-bbox="448 1171 794 1205">pass of tutorials</td> <td data-bbox="794 1171 1141 1205">50.0%</td> <td data-bbox="1141 1171 1487 1205">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	pass of lectures	50.0%	50.0%	pass of tutorials	50.0%	50.0%
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Recommended reading	Basic literature	<p>A.Chapman - Biomechanical analysis of fundamental human movements - Human Kinetics (2008)</p> <p>VM.Zatsiorsky - Kinetics of human motion - Human Kinetics (2002)</p> <p>A.Tozeren - Human body dynamics - Classical mechanics and human movement - Springer (2000)</p>										
	Supplementary literature	<p>Wojnicz W., Wittbrodt E., Modele dyskretne w analizie dynamiki mięśni szkieletowych układu ramię-przedramię (<i>Discrete models in dynamic analysis of skeletal muscles of the arm-forearm system</i>). Wydawnictwo Politechniki Gdańskiej, 2012, p. 1-212, ISBN 978-83-7348-424-5</p> <p>Wojnicz W., Biomechaniczne modele układu mięśniowo-szkieletowego człowieka (<i>Biomechanical models of the human musculoskeletal system</i>). Wydawnictwo Politechniki Gdańskiej, 2018, p. 1-209, ISBN 978-83-7348-727-7</p>										
	eResources addresses											
Example issues/ example questions/ tasks being completed	Describe the behaviour of musculoskeletal system of the upper limb											
Work placement	Not applicable											