GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Engineering biomechanics II, PG_00033002		
Field of study	Medical and Mechanical Engineering, Mechanical and Medical 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

Adresy na platformie eNauczanie:
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

Lectures (DSc PhD W.Wojnicz) (15h)

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 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.

Tutorials (MSc Katarzyna Forysiak) (15h)

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

Subject passing criteria	Passing threshold	Percentage of the final grade
pass of lectures	50.0%	50.0%
pass of tutorials	50.0%	50.0%

Recommended reading

Basic literature	A.Chapman - Biomechanical analysis of fundamental human movements - Human Kinetics (2008) VM.Zatsiorsky - Kinetics of human motion - Human Kinetics (2002) A.Tozeren - Human body dynamics - Classical mechanics and human movement - Springer (2000)
Supplementary literature	Wojnicz W., Wittbrodt E., Modele dyskretne w analizie dynamiki mięśni szkieletowych układu ramię-przedramię (*Discrete models in dynamic analysis of skeletal muscles of the arm-forearm system*). Wydawnictwo Politechniki Gdańskiej, 2012, p. 1-212, ISBN 978-83-7348-424-5 Wojnicz W., Biomechaniczne modele układu mięśniowo-szkieletowego człowieka (*Biomechanical models of the human musculoskeletal system*). Wydawnictwo Politechniki Gdańskiej, 2018, p. 1-209, ISBN 978-83-7348-727-7
eResources addresses	Biomechanika inżynierska,Wykład,IMM,letni 2021-2022 (M:03516W2) - Moodle ID: 21665 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=21665

Example issues/ example questions/ tasks being completed

Describe the behaviour of musculoskeletal system of the upper limb

Work placement

Not applicable