GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Engineering of Rehabilitation, PG_00049457		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Optional subject group 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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Wiktor Sieklicki	
	Teachers	dr inż. Wiktor Sieklicki dr inż. Tomasz Kocejko	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	E-learning hours included: 0.0						

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	3.0	17.0	50

Subject objectives	Expanding knowledge about technical solutions used in devices used for physical rehabilitation.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] Knows and understands, to an increased extent, the basic processes taking place in the life cycle of devices, facilities and technical systems.	the student is able to determine the principle of operation of kinematic mechanisms and systems, knows the principles of functioning of devices for physical therapy and kinesiotherapy, understands how it works and how to obtain muscle electrostimulation, understands the principle of operation of various passive devices for limb stabilization and active devices to support the process of motor rehabilitation	[SW3] Assessment of knowledge contained in written work and projects
[K7_W08] knows and understands, to an increased extent, the fundamental dilemmas of modern civilisation, the main development trends of scientific disciplines relevant to the field of education	the student knows the current state of knowledge and technical solutions used in rehabilitation devices	[SW3] Assessment of knowledge contained in written work and projects
[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	the student is able to define the material properties necessary for the design of the structure of rehabilitation devices, understand the concept of anisotropy of the material and other characteristic features of biomaterials, can estimate the kinematics of the mechanism, can define the requirements for a rehabilitation device, understand the necessary components of the drive system and control of an active rehabilitation device.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	the student is familiarized with specialist literature on the subject of motor rehabilitation and this knowledge is confronted with popular myths about devices supporting motor rehabilitation.	[SK4] Assessment of communication skills, including language correctness

Subject contents

introduction, the concept of disability, division of physiotherapy, short overview of physical therapy, discussion of kinesiotherapy, discussion of the following issues: FES stimulation and EMG testing; bone structure, mechanisms of damage to the skeletal system, bone adaptation, devices for stabilizing broken limbs, soft tissue injuries, rehabilitation on the example of robotic and automated devices

Prerequisites and co-requisites

basic knowledge of mathematics, physics, electronics and electrical engineering

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
project	56.0%	50.0%
credit	56.0%	50.0%

Recommended reading

Basic literature	Kiwerski J. (red.) Rehabilitacja medyczna. Wyd. Lek. PZWL, Warszawa 2005 Myśliborski T. Zaopatrzenie ortopedyczne (protetyka i ortotyka). PZWL Warszawa Nałęcz M. Biocybernetyka i inżynieria biomedyczna 2000. Tom 5. Polska Akademia Nauk, Akademicka Oficyna Wydawnicza Exit, Warszawa 2004. Paśniczek R. Wybrane urządzenia wspomagające i fizykoterapeutyczne w rehabilitacji porażeń ośrodkowego układu nerwowego i amputacjach kończyn, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1998.
Supplementary literature	Będziński R (red.) Biomechanika i inżynieria rehabilitacyjna,
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	definition, goals, functions and scope of rehabilitation, disability; describe: muscle activity, synergistic muscles, agonistic muscles, functional displacement, passive deficiency, marginal resistance, dependence of muscle strength on muscle length, external muscle structure, attachment point, fiber orientation, frequency of stimulation, type of motor unit, type of work, speed of action, etc., basics of EMG measurement, basics of functional electrostimulation (FES), Hooke's law, form strain, Young's modulus, isotropic material, anisotropic material, hysteresis of human tissue loads, bone compactness, the effect of health and tissue on its mechanical properties; features of the strength of human bones; bone adaptation; Wolf's law; types of bone fractures and their consequences; time to heal fractures and to prevent and prevent healing of fractures; external stabilization methods; examples of devices helping people with disability after fractures; types of orthopedic corsets; materials from which corsets are made; types of hoppers for lower limb prostheses; methods of forming prosthetic sockets; functional functions of the foot; lower limb orthoses, active and passive orthoses; upper limb orthotics and prostheses; common symptoms of a stroke; examples of devices that help a person after a stroke;
Work placement	Not applicable

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