



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 2023		Academic year of realisation of subject		2023/2024		
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. Tomasz Kocejko				
			dr inż. Wiktor Sieklicki				
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_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
	[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.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
	[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
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
	credit	56.0%	50.0%
	project	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 porażen 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