GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Engineering problems in rahabilitation, PG_00055768		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	4.0
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	Dominika Szalewska	
	Teachers	Dominika Szalewska	

Lesson types and methods of instruction							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	0.0	0.0	45
	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	45	5.0	50.0	100

Subject objectives	To familiarize students with engineering issues in rehabilitation. Familiarizing with the methods and objectives of rehabilitation as a medical and socio-professional process, indications and contraindications for rehabilitation in cardiovascular diseases, in respiratory diseases, in diseases of the nervous system and diseases of the musculo-skeletal system. Facing students with rehabilitation planning principles, methods of improving and monitoring rehabilitation effects. Mastering the student's ability to use basic equipment and medical devices used in rehabilitation.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K02] he/she is aware of importance of professional dealing and to fulfill ethics obligations, he/she understands other (non-technical) abilities of mechanical engineering professional, their influence on the society and security of environment, he/she is aware of importance of social cooperation	The student is aware of the validity of the non-technical conditions and effects of engineering activities in rehabilitation. Understands the validity of the ability to work in the group, is aware of the role of the rehabilitation team and all professionals included in the team, i.e. medical doctors, nurses, physiotherapists, occupational therapists, psychologists, etc.	[SK5] Assessment of ability to solve problems that arise in practice
	[K6_W13] he/she has knowledge related to application of engineering approaches in medicine or application of medical devices and rehabilitation devices	The student describes the indications and contraindications for rehabilitation, discusses basic issues related to the use of medical equipment and devices in rehabilitation.	[SW1] Assessment of factual knowledge
	[K6_W12] he/she has basic knowledge in the field of fundamental medical sciences, human body anatomy, and physiology, salvage service	The student uses the correct anatomical nomenclature, presents basic knowledge in the field of anatomy, physiology and human pathophysiology. Explains the principles of basic apparatus and devices applicable in medical rehabilitation.	[SW1] Assessment of factual knowledge
	[K6_U11] he/she uses basic medical apparatus and devices, he/she applies knowledge related to the visual diagnosis in the scope of the MME study	The student is able to use basic equipment and medical devices used in medical rehabilitation.	[SU2] Assessment of ability to analyse information
	[K6_U10] he/she is able to assess the human body physic and basic functioning of the body organs, he/she is able to use basic medical knowledge to solve mechanical-medical problems in the scope of the MME study	The student is able to analyze indications and contraindications to rehabilitation. He/she uses the elementary medical knowledge in motor rehabilitation engineering.	[SU2] Assessment of ability to analyse information

Subject contents	Definition and objectives of rehabilitation. Rehabilitation as a medical and socio-professional process. Polish School of Rehabilitation. Organizational model of medical rehabilitation in Poland. Rehabilitation team. *White book of rehabilitation* in Europe. Introduction to therapeutic methods in medical rehabilitation: physiotherapy, pharmacotherapy, orthotic and orthopedic supply, neuropsychological diagnostics and therapy, occupational therapy, integration and reintegration of people with disabilities. Determining the goals of rehabilitation. Rehabilitation of patients with internal organs diseases, including cardiovascular and respiratory system. Medical rehabilitation of patients with diseases of the nervous system. Rehabilitation in the diseases of the musculo-skeletal system. Adapted physical activity as an additional method to offer for people with disabilities. Clinimetry in rehabilitation; quality of life. International Classification of Functioning, Disability and Health - ICF. Discussion of diagnostic and therapeutic devices used in cardiac and pulmonary rehabilitation, including echocardiograph, spirometer, cycle ergometers, treadmill and armchair for endurance training, for strength training and physical therapy. Discussions of the construction and principles of the spiroergometer. Discussion of the construction and principles of using of devices for spirometry and gas exchange assessment during exercise with paying attention to differences in devices of various manufacturers. Presentation of devices used for measuring or estimating physical capacity, i.e. sets for exercise tests using cycle ergometers and a treadmill and echocardiograph as a device for assessing adaptive changes in heart of athletes and patients. Attention is drawn to differences in concepts: "physical performance" and "physical fitness". Understanding the measurement methods of muscle strength, muscle structure, biomechanical and structural parameters of the human movement system, Hills theory. To familiarize students with a balance and stabilometric platforms for assessing balance and conducting a priopriocepitve training with a visual and acoustic biofeedback. The "ACX.REHAB" system, which is the concept of modern rehabilitation and diagnostics in virtual reality, combining classic methods of improving functional status with the possibilities of modern technology. Familiarization of students with the reaction of patients with implantable devices on physical exercise, discussion of modern methods used in the rehabilitation of patients with heart failure, including cardioimpedance. Rehabilitation in respiratory diseases. Rehabilitation of patients with diabetes and patients with renal failure and after cardiac surgery. Discussing differences in proceedings with patients with various diseases. Discussion of hemodialysis, exercise after acoronary artery bypass grafting, after the heart valve replacement, after heart transplantation. Discussion about devices for echocardiography, electrocardiography, long-term ECG Holter monitoring. Role of education in rehabilitation. Rehamanager as a new member of the rehabilitation team. Telemedicine in neurological and cardiac rehabilitation. Prosthesis of the limbs. Discussion of construction, types, applications and control of the upper limb prosthesis; "Cyberhand" - prosthesis of the future. The most common orthosis of the upper limb. Prosthesis and orthosis of the lower limbs - general construction, division due to construction and application, modern knee joints; C-leg prosthesis. The most common orthosis of the lower limbs. The correct body posture and the most common defects of body posture in children and adults. Methods for assessing the body posture. Additional methods and devices used in rehabilitation - pedobarographic examination, balance platform, "Hand-Tutor", dynamometer. Physical therapy. Learning about the use of magnetic field, electrical methods, mechanical and thermal therapy in patients' rehabilitation. The most common devices used in rehabilitation - Sollux lamp, Bioptron, Diadynamik, jonophoresis, fonophoresis, shortwave diathermy, Terapuls, laserotherapy, cryotherapy, hydrotherapy, elevators used in discoapthy. Aquatic therapy.
Prerequisites and co-requisites	Basic knowledge of the subjects: Human anatomy, Human physiology, Selected issues in neurology for engineers, Selected issues for engineers in cardiology, Selected issues in surgery and orthopedics for engineers.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium	60.0%	100.0%
Recommended reading	Basic literature	1. Kwolek A. (red.). Rehabilitacja medyczna Tom I i II, Wyd. Edra Urban&Partnen, Wrocław 2011. 2. Ryszard Piotrowicz, Anna Jegier, Dominika Szalewska i wsp. Rekomendacje w zakresie realizacji kompleksowej rehabilitacji kardiologicznej: stanowisko ekspertów Sekcji Rehabilitacji Kardiologicznej i Fizjologii Wysiłku Polskiego Towarzystwa Kardiologicznego. Wydawnictwo AsteriaMed, 2017.	
	Supplementary literature	1. The White Book (WB) of Physical and Rehabilitation Medicine (PRM) in Europe, 2018 2. Cifu D., Lew H.: Braddoms Rehabilitation care: a clinical handbook. Elsevier, 1st edition 2017. 3. Giermek i wsp.: Wyroby medyczne. Zaopatrzenie indywidualne, Wyd. PZWL, Warszawa 2016.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	List the stages of rehabilitation after a myocardial infarction. List the methods of rehabilitation after ischemic stroke. Name the members of the rehabilitation team. Indicate devices used for functional diagnostics of patients with cardiovascular diseases. Indicate the medical equipment needed in the rehabilitation of patients after hemorrhagic stroke.		
Work placement	Not applicable		

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