GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Medical equipment II, PG_00039386		
Field of study	Medical and Mechanical Engineering, Mechanical and Medical Engineering		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Machine Design and Vehicles -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	Michał Penkowski	
	Teachers	Michał Penkowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	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	3.0	27.0	75

Subject objectives

The main aim is to introduce into profesional subject of processing and measurement of biomedical signals which are acquired in specialist medical equipment.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U06	He/she can estimate role of medical engineering in modern medical practice.	[SU4] Assessment of ability to use methods and tools
K6_W13	He/she can describe basic types of medical equipment. Can explain physical basis of its work and can propose different alternative ways of measurements.	[SW1] Assessment of factual knowledge
K6_U11	He/she can apply analytical method for solving some problems found in construction of medical apparatus.	[SU4] Assessment of ability to use methods and tools

Subject contents

1. Pressure measurement – units, range of change, sensors
2. Temperature measurement – units, surface temperature, inner temperature of the human body, temperature sensors
3. Electrical activity – ECG, EEG, electromiography, signal parameters, dynamics of the measured values
4. Electrodes, amplifiers and other aspects of electrical measurements
5. Flow rate measurement – units, sensors, specific of the blood flow
6. Ultrasound – generation, propagation, medium parameters, thermal effects, diagnostic application
7. Ionizing radiation – types of radiations, sources, basic physical phenomena, units used in dosimetry, diagnostic application, therapeutic application
8. Electricity – electrical parameters of different tissues, current flow through the body, associated phenomena, electrical stimulation and its application in physiotherapy
9. Infrared and ultraviolet radiation. Characteristics, units, parameters. Interaction with the human body. Application for therapy.
10. Concentration measurements – units, parameters. Methods of measurement, examples of application in the medicine and physiology.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">• basic knowledge of physics, mathematics and electronics
• practice in the application of linear function
• knowledge of Fourier transform and complex functions
• basic knowledge of human physiology
• fluency in the definition of physical parameters and their units
• general knowledge of sensors</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>exam</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Problems of biocybernetics and biomedical engineering. Ed. M. Nałęca. V.2. Biomesurements. WKiŁ Warszawa 1990
2. Basis of biophysics. Ed. A. Pilawski. PZWL Warszawa 1985</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. A. Straburzyńska-Lupa, G. Straburzyński. Physiotherapy. PZWL Warszawa 2003
2. J. Ross Macdonald. Impedance spectroscopy. Wiley-interscience 2005</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Give the typical properties of EKG, EEG, EMG, ENG signals.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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