



## Subject card

Subject name and code	Medical equipment II, PG_00039386						
Field of study	Medical and Mechanical Engineering, Medical and Mechanical 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 professional 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	<ol style="list-style-type: none"> <li>1. Pressure measurement – units, range of change, sensors</li> <li>2. Temperature measurement – units, surface temperature, inner temperature of the human body, temperature sensors</li> <li>3. Electrical activity – ECG, EEG, electromiography, signal parameters, dynamics of the measured values</li> <li>4. Electrodes, amplifiers and other aspects of electrical measurements</li> <li>5. Flow rate measurement – units, sensors, specific of the blood flow</li> <li>6. Ultrasound – generation, propagation, medium parameters, thermal effects, diagnostic application</li> <li>7. Ionizing radiation – types of radiations, sources, basic physical phenomena, units used in dosimetry, diagnostic application, therapeutic application</li> <li>8. Electricity – electrical parameters of different tissues, current flow through the body, associated phenomena, electrical stimulation and its application in physiotherapy</li> <li>9. Infrared and ultraviolet radiation. Characteristics, units, parameters. Interaction with the human body. Application for therapy.</li> <li>10. Concentration measurements – units, parameters. Methods of measurement, examples of application in the medicine and physiology.</li> </ol>						
Prerequisites and co-requisites	<ul style="list-style-type: none"> <li>• basic knowledge of physics, mathematics and electronics</li> <li>• practice in the application of linear function</li> <li>• knowledge of Fourier transform and complex functions</li> <li>• basic knowledge of human physiology</li> <li>• fluency in the definition of physical parameters and their units</li> <li>• general knowledge of sensors</li> </ul>						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		exam	60.0%
Recommended reading	Basic literature	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	
	Supplementary literature	1. A. Straburzyńska-Lupa, G. Straburzyński. Physiotherapy. PZWL Warszawa 2003 2. J. Ross Macdonald. Impedance spectroscopy. Wiley-interscience 2005	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Give the typical properties of EKG, EEG, EMG, ENG signals.		
Work placement	Not applicable		