



Subject card

Subject name and code	Electronical Medical Equipment I, PG_00047789						
Field of study	Biomedical Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2025/2026		
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	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jerzy Wtorek					
	Teachers	prof. dr hab. inż. Jerzy Wtorek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	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	13.0		32.0		75
Subject objectives	To familiarize students with the types and requirements for the medical equipment, especially electronic medical equipment.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student gained knowledge of the basic requirements for medical devices			[SW1] Assessment of factual knowledge		
	[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	The student gained knowledge on measurement methods needed to understand the principle of medical devices operation			[SW1] Assessment of factual knowledge		
	[K6_W06] Knows and understands the basic processes occurring in the life cycle of devices, facilities and systems specific to a given field of study.	The student gained knowledge on requirements and standards obeying medical devices			[SW1] Assessment of factual knowledge		
	[K6_W54] Knows and understands, to an advanced extent, selected aspects of biomedical diagnostics	The student knows the basic measurement methods used in medical, diagnostic techniques known physiological systems and principles of imaging techniques			[SW1] Assessment of factual knowledge		

Subject contents	1 Characteristics of medical equipment (AM) and the conditions to be met by construction of such devices, 2 Basics safety considerations, 3 Sources of electrical signals and their biological characteristics, 4. Electrography and their design, 5. Cell's electrography, 6. ECG - electrodes and measuring systems, 7. Vectorcardiography, 8. Holter equipment and special, 9. Electromyography and plethysmography, 10. Fundamentals of EEG measurement, 11. Problems of electrographic signal analysis, 12. Electroimpedance measurements - ICG, 13. Biomechanical signals measurements, 14. Polygraphs and their applications, 15. Nerve and muscle stimulators, 16. Defibrillators, pacemakers and cardioverter, 17. Spirometry, 18. Audiometry, 19. Intensive Care Medicine, 20. Equipment and screening systems, 21. Apparatus Ultrasound - basics, 22. Ultrasound, 23. Methods of Doppler ultrasound technique, 24. Fundamentals of radiological measurements, 25. X-ray detectors, 26 The concept of tomographic measurements, tomographic scanners types, 28. Magnetography and its applications, 29 Overview of optical diagnostic methods, 30. Development trends in the design of medical equipment		
Prerequisites and co-requisites	Backgrounds of physics, mathematics and anatomy		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	60.0%	100.0%
Recommended reading	Basic literature	Materiały pomocnicze do wykładu i laboratorium, Gdańsk, 2010 M. Nałęcz [red.] Biocybernetyka i Inżynieria Biomedyczna, t.2. Biopomiary, Exit, Warszawa, 2001 J. D. Bronzino [ed.], The Biomedical Engineering Handbook, CRC, 2006	
	Supplementary literature	Enderle [red], Introduction to biomedical engineering, Elsevier, 2005 Pawlicki G., Podstawy Inżynierii Medycznej, OWPW, Warszawa, 1997	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1. Describe factors determining a safety of medical equipment?		
Work placement	Not applicable		