



## Subject card

Subject name and code	Basics of Medical Devices Design , PG_00047846						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
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			5.0		
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 dr inż. Adam Bujnowski mgr inż. Kamil Osiński					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	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	60		5.0		60.0	125
Subject objectives	The aim of the course is to introduce students with basic problems inherent to designing electronic medical equipment						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	The student can choose the appropriate calculation method, including numerical one, to obtain the expected effect.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study	The student is able to choose the right solution for a specific technical problem.	[SU4] Assessment of ability to use methods and tools
	[K6_U10] can individually plan their own lifelong education, also by means of advanced information and communication technologies (ICT), and communicate with people from their environment, firmly justify their point of view, participate in debates, present, assess and discuss different opinions and points of view, as well as use specialist terminology related to the field of study in communication	Student performs designing tasks both individually and in cooperation with other team members according to schedule prepared and can present effects of work	[SK3] Assessment of ability to organize work [SK1] Assessment of group work skills [SK2] Assessment of progress of work
[K6_K01] is ready to cultivate and disseminate models of proper behaviour in and outside the work environment; make independent decisions; critically evaluate actions of their own, teams they lead and organisations they are part of; take responsibility for results of these actions; responsibly perform professional roles, including: n - observing rules of professional ethics and require it from others, n - care for the achievements and traditions of the profession	The student understands the consequences of incorrect solutions in the construction of medical equipment	[SK5] Assessment of ability to solve problems that arise in practice	
Subject contents	1 Computer aided design, CAD, CAM, 2 Types of medical equipment, 3 Safety Aspects, 4. Safety Classes, 5 Monitoring and measurement, 6 Requirements definition (end user, manufacturer, Functional, exploitation), 7. Elements of reliability of electronic devices, 8 Product definition, 9 Determinants design (environmental, production ....), 10. life cycle of the project, 11. Ecological Design, 12 Construction of a typical medical device, 13 Ways implementation of the application part, 14 Ways implementation signal barriers, 15 invasive and non-invasive measurements, 16 power, and security aspects, 17 Power Management, 18 Standards and requirements 19 EM Environment, 20. Disturbance characteristics, 21 Compatibility EM, 22 Compatibility Biological 23 Standards, 24 Software, 25 Real-time system, 26 Self-diagnosis, 27 software diagnostic methods, 28 IEEE 829-1998, 29. methods of equipment aging, 30 The certification		
Prerequisites and co-requisites	Electronic circuit, Digital circuits, Microcontrollers		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	60.0%	30.0%
	Lecture	60.0%	30.0%
	Project	60.0%	40.0%
Recommended reading	Basic literature	Kisiel R., Bajera A., Podstawy konstrukcji urządzeń elektronicznych  Norma PN-EN 60601	
	Supplementary literature	Biomedical Circuits and Systems, IEEE Transactions on	
	eResources addresses	Adresy na platformie eNauczenie: Podstawy_Projektowania_Urządzeń_Medycznych_2023_24 - Moodle ID: 37233 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=37233">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=37233</a>	
Example issues/ example questions/ tasks being completed	Design and develop an EOG measurement unit.		
Work placement	Not applicable		

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