



## Subject card

Subject name and code	Wearable electronics, PG_00053371						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-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	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		2.0		
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. Piotr Jasiński				
	Teachers		dr inż. Karolina Cysewska				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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		3.0		17.0	50
Subject objectives	The aim of the course is to familiarize students with intelligent electronic devices that are worn close to and / or on the surface of the skin, where they detect, analyze and transmit information on, i.e.biosignals.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Can design and prepare a wearable electronics system	[SU1] Assessment of task fulfilment
	[K7_W03] Knows and understands, to an increased 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.	Knows the principle of operation of wearable sensors and wearable power supply components	[SW1] Assessment of factual knowledge
	[K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	Can connect and program the wearable components into a working system	[SU1] Assessment of task fulfilment
	[K7_W05] Knows and understands, to an increased extent, methods of process and function support, specific to the field of study.	Knows and understands the possibilities of wearable electronics for the needs of biomedical engineering	[SW1] Assessment of factual knowledge
	[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Knows and understands the structure and operation of wearable electronics components and is able to design a system composed of them	[SW1] Assessment of factual knowledge
Subject contents	Biochemical and chemical wear sensors. Inertial wear sensors. Optical wear sensors. Electronic knitted fabrics and textile fabrics. Flexible electronics: materials, devices and assembly. Power wear electronics and energy management. Collecting energy on the human body: temperature gradient, movement, light, electromagnetic field. Communication technologies in wearable electronics. Antennas. Wearable electronics in sports. Wearable electronics in medical applications.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lab	50.0%	40.0%
	exam	50.0%	60.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"><li>Tao, Xiaoming, ed. Wearable electronics and photonics. Elsevier, 2005.</li><li>Kate Hartman, Make: Wearable Electronics: Design, Prototype, and Wear Your Own Interactive Garments, Maker Media, 2014</li><li>Subhas C. Mukhopadhyay, Wearable Electronics Sensors: ForSafe and Healthy Livin, Springer, 2015</li></ul>	
	Supplementary literature	Czasopismo Frontiers in Elelectronics - Wearable Elelectronics	
	eResources addresses	Adresy na platformie eNauczanie: Elektronika nasobna 2023/2024 - Moodle ID: 33891 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33891">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33891</a>	
Example issues/ example questions/ tasks being completed	List and describe power supply systems in the wearable electronics		
Work placement	Not applicable		