



## Subject card

Subject name and code	Electronic Cards and Modules Design, PG_00048102						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2026/2027		
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	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Grzegorz Lentka				
	Teachers		dr hab. inż. Grzegorz Lentka				
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		2.0		18.0	50
Subject objectives	Familiarize students with the rules of design of electronic cards and module design.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems	The student knows and is able to use CAD programs in the preparation of the project and device documentation in the package system.			[SW1] Assessment of factual knowledge		
	[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	The student is able to prepare the design and documentation of the device in the package system.			[SU1] Assessment of task fulfillment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
Subject contents	Introduction. Exam rules. Literature. Definition of the module. Particularity of the module designs. Stages of the design process. Computer aided design of mechanical of modules – AutoCAD, A9Cad.  Review of advanced computer aided design of electronic boards (diagram, simulation, layout). Problems of electronic card designing using of Multilayer PCB and SMT technology. Principles of preparation of mechanical, electrical and mechanical documentation. Documentation of PCB cards. Mechanical and electrical standards of the modules – inches and centimeters unit. Examples of 19" modules (IEC60297). Eurocard modules. Examples of design printed boards, plug-in units, subracks, cabinets and enclosures. Supplementary products. Grounding, shielding and cooling of the modules. Enclosures – IP degree of protection, flammability, tests of electromagnetic shielding efficiency, climatic tests, static load and dynamic tests. Safety requirements. Examples of the modules made by Schroff company. Internal buses in the modules – CAMAC, VMEbus, MultibusII, VXIbus at all. Review of external buses standards (UART 16550, PCF series at all). Modules supply. Mains, battery and uninterrupted power supply. Examples of the module equipment – data acquisitions and control systems.						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	50.0%	50.0%
	Coloquium	50.0%	50.0%
Recommended reading	Basic literature	<p>Materiały firmowe Schroff (<a href="http://www.schroff.pl/internet/html_pl/index.html">http://www.schroff.pl/internet/html_pl/index.html</a>):</p> <p>Standards Summary, Electronics Packaging (Main Catalog), System Solutions.</p> <p>Maciej Sydor. Wprowadzenie do CAD. Podstawy komputerowo wspomaganego projektowania. Wydawnictwo Naukowe PWN. Warszawa 2009.</p> <p>Jan Burcan. Podstawy rysunku technicznego. WNT Warszawa 2006.</p>	
	Supplementary literature	<p>Sebastian Wilczewski. MS Project 2010 i MS Project Server 2010. Efektywne zarządzanie projektem i portfelem projektów. Helion. Gliwice 2011.</p> <p>Tadeusz Sidor. Komputerowa analiza elektronicznych układów pomiarowych. AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne. Kraków 2006.</p> <p>Waldemar Oleksiuk, Krzysztof Paprocki. Konstrukcja mechanicznych zespołów sprzętu elektronicznego. WKiŁ. Warszawa 1997.</p> <p>Ryszard Kisiel. Podstawy technologii montażu dla elektroników. BTC Legionowo 2012.</p>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		