



## Subject card

Subject name and code	Embedded Systems in Automatic Control and Robotics, PG_00049435						
Field of study	Automatic Control, Cybernetics and Robotics						
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			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Tomasz Stefański					
	Teachers	mgr inż. Kajetan Kruczkowski					
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	Presenting students modern embedded systems used in automation and robotics.						

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 knows the architecture of embedded systems	[SW1] Assessment of factual knowledge
	[K6_U03] can design, according to required specifications, and make a simple 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	The student is able to design simple embedded systems	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[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 program embedded systems	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[K6_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	The student understands the principles of designing embedded systems	[SW1] Assessment of factual knowledge
Subject contents	1. The genesis of embedded systems as a field based on computer science and automation.2. Hardware and functional structure of computer control systems, classification and characteristics of basic structures, hardware requirements for interrupts, memory and I / O channels.3. Computers, microcontrollers and FPGAs.4. ARM processor family. Multiple-Processor System on Chip (MPSoC).5. Support for peripheral devices.6. Embedded systems software on the example of ARM processors.7. Operating systems used in embedded systems.8. Communication interfaces in embedded systems: HART, ASI and CAN networks and the ZigBee wireless network in accordance with the IEEE 802.15.4 standard.9. Real-time systems.10. Applications of embedded systems in distributed measurement systems, intelligent buildings, hospitals, etc.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final test	50.0%	40.0%
	Project assignments	50.0%	60.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Dorf R.C., Bishop R.H. Modern control systems, Addison Wesley, 1995</li> <li>2. Marwedel P., Embedded System Design, Kluwer Academic Publishers, Boston 2003, <a href="#">ISBN 1-4020-7690-8</a></li> <li>3. Olsson G., Piani G., Computer systems in automation, Prentice-Hall, Londyn New York 1992</li> <li>4. Ting-pat So A., Intelligent building systems, Kluwer Academic Publ., Boston London 1999</li> </ol>	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Real-time sound filtration system on the evaluation board.</li> <li>2. LED control.</li> <li>3. Control of the liquid crystal display.</li> </ol>		
Work placement	Not applicable		