



Subject card

Subject name and code	Microprocessors And Microcontrollers, PG_00047916						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2022/2023		
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		2.0		
Learning profile	general academic profile		Assessment form		exam		
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				
			dr inż. Maciej Kokot				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		2.0		33.0	50
Subject objectives	Getting familiar with architectures, construction and examples of nowadays microprocessors and microcontrollers						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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	Student identifies basic functional components of microprocessor, differentiates between von Neumann and Harvard architectures and compares CISC and RISC processors. Defines microcontroller, microcontrollers families with examples. Identifies peripherals of microcontrollers with examples.	[SW1] Assessment of factual knowledge
	[K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n	Points out design tool and their usage.	[SU3] Assessment of ability to use knowledge gained from the subject
	[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	Describes performance improvement techniques using examples of modern processors.	[SU2] Assessment of ability to analyse information
	[K6_U07] can apply methods of process and function support, specific to the field of study	Explains microprocessor communication with memories and peripheral devices.	[SU2] Assessment of ability to analyse information
	[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	Uses layered model of microcontroller, classifies specific properties of microcontrollers.	[SU2] Assessment of ability to analyse information
Subject contents	1. Microprocessor. History and development of microprocessors. Basic functional components of microprocessor 2. Programming model of microprocessor. Von Neumann and Harvard architectures. 3. Evolution of microprocessors of x86 family. 8, 16, 32, 64bit processors. Extensions of CISC architecture and instruction set 4. RISC microprocessors. Load-store architecture. 5. Performance improvement techniques: pipeline processing, cache memory, multithreading, multicore, parallel processing of instructions and data. 6. Comparison of advanced constructions of microprocessors (ARM, ARM, PowerPC, MIPS, Itanium, SPARC). 7. Microprocessor communication with memories and peripheral devices. Universal and specialized input-output circuits. Interrupt system of microprocessor. External and internal interrupts. Interrupt masking. Interrupt servicing. Direct memory access. DMA controller. 8. Microcontrollers. Architecture and usage. Layered structure of micro-controllers. Microcontrollers families. 9. Specificity of microcontrollers: universal ports, reset circuitry, supervising circuits (BOR, LVD, watchdog), clock oscillator and clock distribution circuits, power saving techniques and special modes. 10. Peripheral circuits of microcontrollers. Timer-counter circuits. 11. Serial communication ports: UART, SPI, I2C, USB. 12. Microcontroller family examples (PIC, AVR, ARM). 13. Description and construction of example microcontroller. 14. Specificity of software development for microcontrollers. 15. Tools for development and evaluation of microcontroller systems.		
Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	66.0%	100.0%
Recommended reading	Basic literature	1. J. Crisp: Introduction to Microprocessors and Microcontrollers, Newnes 2004 2. S. Furber: ARM System-on-Chip Architecture (2nd Edition), Addison-Wesley Professional 2000	
	Supplementary literature	1. A. Sloss, D. Symes, C. Wright: ARM System Developer's Guide: Designing and Optimizing System Software, Morgan Kaufmann 2004 2. J. Majewski: Programowanie mikrokontrolerów LPC2000 w języku C, pierwsze kroki, BTC 2010 3. L. Bryndza: LPC2000 Mikrokontrolery z rdzeniem ARM, BTC, Warszawa 2007	

	eResources addresses	Adresy na platformie eNauczenie: Mikroprocesory i Mikrokontrolery 2022/2023 - Moodle ID: 25417 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=25417
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	