GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Programming Techniques in Embedded Systems, PG_00053917		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
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	exam
Conducting unit	Department of Automatic Control -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Raczyński	
	Teachers	dr inż. Paweł Raczyński	

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	3.0	32.0	50

Subject objectives

The aim of the course is to learn the rules and the acquisition of programming skills in embedded systems

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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 knows how to create software for embedded systems with PCs. Student and knows how to use PC104, VME and Compact PCI buses in practice. The student knows how to use the operating systems Linux, Windows and others. The student knows how to use the input and output interface software techniques in practice. The student knows and is able to put into practice the techniques of creating real-time software. The student knows how to use the diagnostic elements of embedded computer systems in practice.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[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 knows the rules for creating software for embedded systems with PCs. The student knows the rules for using the PC104, VME and Compact PCI buses. The student knows the rules of practical use of Linux, Windows and other operating systems. The student knows the techniques of input and output interface software. The student knows the techniques of creating real-time software. The student knows the rules for implementing the elements of self-diagnosis of embedded computer systems.	[SW1] Assessment of factual knowledge

Subject contents	1. Introduction into embedded systems 2. Embedded systems based on PC standard computers 3. Modular computers based on PC104 standard bus 4. Modular computers based on VME standard bus 5. Modular computers based on COMPACT PCI standard bus 6. Controlled object interface organization 7. Operating system in embedded systems: WINDOWS embedded, Linux, QNX 8. Embedded system software specificity 9. Object interface – using manufacturer handlers 10. Object interface – writing handler techniques 11. Hardware interrupt handling techniques: interrupt service routines, interrupt initiated task for service requests 12. Real time – techniques of implementation 13. Software handlers for standard communication interfaces 14. Microcontrollers in embedded systems 15. Operating systems for microcontrollers - Linux 16. Dedicated software – mini kernel techniques 17. Dedicated software – interrupt handling procedures technique 18. Dedicated software – software loop techniques 19. Microcontroller built-in resources handling techniques 20. Standard communication interface handling 21. Basics of self-diagnostics in embedded system software 22. Usage of microcontroller built-in diagnostic resources –JTAG interface 23. Embedded system examples
Prerequisites and co-requisites	No requirements
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	51.0%	30.0%
Presentations	0.0%	10.0%
Practical exercise	51.0%	60.0%

Recommended reading	Basic literature	A. Pyrchla, B. Danowski, BIOS. Przewodnik, Helion 2007 B. Zieliński, Układy mikroprocesorowe. Przykłady rozwiązań, Helion 2002 E. Wróbel, Asembler Praktyczny kurs asemblera, Helion 2004 Katalogi, strony WWW i podręczniki firmowe M. Szafarczyk, D. Śmigulska-Grądzka, R. Wypysiński Podstawy układów sterowań cyfrowych i komputerowych PWN 2007 Metzger P. "Anatomia PC", HELION, 2008 Misiurewicz P. Podstawy techniki mikroprocesorowej. WNT 1991 W. Nawrocki, Komputerowe systemy pomiarowe, WKŁ
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	