GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer Systems Architecture, PG_00047630						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2024		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	3		Language of instruction	Polish			
Semester of study	5		ECTS credits	3.0			
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	30.0	0.0	0.0	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	42.0		75
Subject objectives	The aim of the course is to learn the principles of operation and construction of functional blocks and organization of computer systems						

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	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
[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 describes the construction and functioning of the microprocessor. Student describes elements of computer system architecture. Student describes the principles of computer system programming. Student describes the system of inputs and outputs of the computer system. Student describes the interrupt system. Student describes various types of computer system memory. Student describes PCs and BIOS program module. The student knows the issues related to creating computer network connections.	[SW1] Assessment of factual knowledge
[K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study	The student knows and understands at an advanced level the architecture of computer systems and the basics of their programming to support processes and functions specific to the scope of work of an automation engineer.	[SW1] Assessment of factual knowledge

Subject contents

1. Lecture organization, credit rules, literature 2. Microprocessor Intel x86 architecture, general purpose registers, arithmetic and logic unit, flags 3. Addressing space, memory and input-output addressing, memory segmentation, addressing modes 4. Microprocessor programming model, instruction cycle 5. Instructions and techniques of data transfer, block data transfer 6. Arithmetic instructions, number formats, acting on multi precision numbers, floating point calculations software emu-lation, using arithmetic coprocessor 7. Operations on bits and strings 8. Unconditional and conditional branch instructions, call and ret instruction, stack usage 9. Processor control organization, bus interface unit and instruction execute unit, instruction queue 10. Interrupt system, vectored interrupts, multi level interrupt service 11. Processor working in real and protected modes 12. Basics of programming in assembler, instruction mnemonics, variables, labels, directives, assembler syntax 13. Program assembly techniques, name dictionary, error reports, linking 14. Macroinstructions, subroutines, parameter passing into subroutines, stack frame 15. Memory models and its consequences, static and dynamic memory allocation techniques 16. Mixed programming, calling convention used in C and PASCAL languages 17. Input and output device standards, input and output devices service techniques 18. Parallel and serial data exchange, hardware support techniques 19. Hardware and software interrupts service techniques, programmable interrupt controller 20. Direct memory access (DMA), DMA controller, CPU-DMA interaction, data transfer programming and performance phase 21. Basic of x86-32 and x86-64 architecture, CISC and RISC processors 22. PC architecture 23. Mass data storage devices, hard disks, optic drives, FLASH memories 24. BIOS organization and BIOS service subroutines 25. User console, keyboard and mouse service techniques, data buffering methods 26. Screen service in text and graphic modes 27. Hardware interrupts service techniques in PC standard computers 28. Software interrupts, parameter passing into BIOS service routines 29. Real time clock and system clock 30. Operating system, organization, OS service functions 31. Introduction into embedded systems 32. Embedded systems based on PC standard computers 33. Modular computers based on PC104 standard bus 34. Modular computers based on VME standard bus 35. Modular computers based on COMPACT PCI standard bus 36. Controlled or monitoring object interface organization 37. Operating system in embedded systems: WINDOWS embedded, Linux, QNX 38. Embedded system software specificity 39. Object interface device handlers 40. Hardware interrupt handling techniques: interrupt service routines, interrupt initiated task for service requests 41. Real time techniques of implementation 42. Software handlers for standard communication interfaces 43. Dedicated software: mini kernel techniques, interrupt handling procedures techniques, software loop techniques 44. Software diagnostics 45. Embedded system examples

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
2 partial exams	51.0%	100.0%

Recommended reading	Basic literature	A. Skorupski, Podstawy budowy i działania komputerów, WKŁ B. Zieliński, Układy mikroprocesorowe. Przykłady rozwiązań, Helion 2002 Katalogi, strony WWW i podręczniki firmowe. Metzger P. "Anatomia PC", HELION, 2008. Niederliński A. Mikroprocesory mikrokomputery mikrosystemy. WSiP 1988. W. Komorowski, Krótki kurs architektury i organizacji komputerów, Mikom 2004
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

Document generated electronically. Does not require a seal or signature.