GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer System Organization, PG_00053915		
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	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	4.0	41.0	75

Subject objectives

The main aim of the subject is to gain knowledge about the most common computer systems organization and basic knowledge of computer system components and principles of their operation.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study	The student knows the principles of building typical and specialized computer systems. Knows the principles of cooperation of their basic functional blocks and knows the basics of programming such systems at the level of use of registered programming, close hardware.	[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

Subject contents	1. Introduction 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. Instruction set overview 6. Instructions and techniques of data transfer, block data transfer 7. Arithmetic instructions, number formats, acting on multi precision numbers 8. Coprocessor, floating point calculations 9. Operations on bits and strings 10. Unconditional and conditional branch instructions, call and ret instruction, stack usage 11. Processor control organization, bus interface unit and instruction execute unit, instruction queue 12. Interrupt system, vectored interrupts, multi level interrupt service 13. Processor working in real and protected modes 14. Basics of programming in assembler, instruction mnemonics, variables, labels, directives, assembler syntax 15. Program assembly techniques, name dictionary, error reports, linking 16. Subroutines and macroinstructions 17. Parameter passing into subroutines, stack frame 18. Memory models and its consequences, static and dynamic memory allocation techniques 19. Mixed programming, calling convention used in C and PASCAL languages 20. Input and output device standards, input and output devices service techniques 21. Parallel and serial data exchange, hardware support techniques 22. Hardware and software interrupts service techniques 23. Interrupt controller, programmable interrupt modes 24. Direct memory access (DMA), DMA controller, CPU-DMA interaction, data transfer programming and performance phase 25. Basic of x86-32 i x86-64 architecture, CISC and RISC processors 26. PC architecture 27. Mass data storage devices, hard disks, optic drives, FLASH memories 28. Input and output service techniques, separate memory and IO addressing systems and memory mapped systems 29. BIOS organization and BIOS service subroutines 30. User console, keyboard and mouse service techniques, data buffering methods 31. Screen service in text and graphic modes 32. Hardware and software interrupts service techniques in PC standard computers 33. Software interrupts, parameter passing into BIOS service routines 34. Real time clock and system clock 35. Operating system, organization, OS service functions 36. Von Neuman and Harward architecture, microcontroller architecture 37. Microcontroller memory architecture, register sets, bit organized memory, special function registers 38. Data exchange with external devices, port organization, port basic and alternate functions, read-modify-write opera-tions 39. Programmable counters and its applications 40. Standard interfaces and data exchange hardware support techniques 41. Interrupt sources and interrupt system in microcontrollers 42. Real time ports, time related input and output operations hardware support techniques 43. Context switching, software and hardware support 44. Expanding of microcontroller resources techniques, power saving modes 45. Data exchange with analog devices, A/D converters and PWM outputs 46. Basic of microcontroller programming techniques 47. Selected microcontrollers compatible with Intel MCS-51 family 48. Selected microcontrollers from Atmel AVR family
Prerequisites and co-requisites	Basic knowledge of digital techniques and circuits
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	51.0%	100.0%

Recommended reading	Basic literature	A. Pyrchla, B. Danowski, BIOS. Przewodnik, Helion 2007 A. S. Tanenbaum, Strukturalna organizacja systemów komputerowych, Helion 2006 B. Zieliński, Układy mikroprocesorowe. Przykłady rozwiązań, Helion 2002 K. R. Irvine, Asembler dla procesorów Intel vademecum profesjonalisty, Helion 2003 Katalogi, strony WWW i podręczniki firmowe Metzger P. "Anatomia PC", HELION, 2008 N. Noam, S. Shimon Elementy systemów komputerowych. Budowa nowoczesnego komputera od podstaw., WNT 2008 Niederliński A. Mikroprocesory mikrokomputery mikrosystemy. WSiP 1988
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie: Organizacja Systemów Komputerowych wykład - 2023/2024 - Moodle ID: 29084 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29084
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	