Course Syllabus
Course from study programme for the cycle: 2022/2023

I. General Information

Course name	Computer architecture
Programme	Informatics
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BA
Form of studies (full-time, part-time)	full-time
Discipline	Informatics
Language of instruction	English

Course coordinator	Prof. DSc. Anatoliy Melnyk

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	15	I	3
tutorial			
classes			
laboratory classes	15	I	
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Knowledges of mathematics and computer science at the secondary school level

II. Course Objectives

C1 - Transfer of knowledge about data representation in computer
C2 - Transfer of knowledge about the computer building
C3 - Transfer of knowledge about the computer general organization and functioning

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	Student learns about the properties of von Neumann computer architecture, main computer functions, functional computer units, their tasks and main characteristics, computer types, principles of memory organization with random, sequential, associative and ordered access.	K_W01
W_02	Student learns how instructions are executed in computer, instruction coding, instruction formats, addressing modes, and classification of computer architecture	K_W01
W_03	Student learns positional number system, methods of numbers conversion from decimal to binary notation and vice versa, representations of an integer inside a computer: unsigned, sign-and-magnitude, one's complement, and two's complement, IEEE 754 standard of numbers	K_W01
W_04	Student learns how to perform arithmetic operations on fixed- and floating-point numbers	K_W01
W_05	Student learns the Boolean algebra and its application to the logic circuits design	K_W01
W_06	Student learns the design of combinational and sequential circuits, the operation of synchronous and asynchronous triggers	K_W01
SKILLS		
U_01	Student is able to convert numbers from one numbering system to another	K_U04, K_U06, K_U30
U_02	Student is able to design simple digital circuits and combinational circuits.	K_U04,
U_03	Student is able to create a simple program in assembler	K_U04, K_U06
SOCIAL COMPETENCIES		
K_01	Student is able to discuss the architecture of contemporary computer systems	K_K01
K_02	The student can conduct a critical evaluation of the received information	K_K01

IV. Course Content

Lectures:
Development of computer architecture, main computer functions, functional computer units, their tasks and main characteristics, technological aspects, Moore's law, types of computers, random access memory organization, associative memory, sequential memory, register memory of the processor, instructions execution in computer, instruction coding, instruction formats, list of instructions, addressing modes, classification of computer architecture, data representation, positional number system, positional number system, methods of numbers conversion from decimal to binary notation and vice versa, representations of an integer inside a computer: unsigned, sign-and-magnitude, one's complement, and two's complement, IEEE 754 standard of

numbers representation, performing operations on floating point numbers, main data processing operations, basics of digital technology, logic gates, combinational circuits, sequential circuits, logical operations, arithmetic operations on fixed and floating point numbers, design of combinational and sequential circuits, synchronous and asynchronous operation, computer processors of CISC, RISK, superscalar and vector architecture, VLIW processors, arithmetic-logic unit, control unit, multilevel memory organization. Laboratory classes: Data representation, positional numeral system, conversion from binary numeral system into decimal and vice versa, representation of signed numbers, fixed point format, operations execution on fixed points numbers, adding signed and unsigned binary numbers, multiplication of signed and unsigned binary numbers, floating point format, arithmetic operations on floating point numbers, basics of digital technology, logic gates, combination circuits, sequential circuits, combinational and sequential circuits design.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
		KNOWLEDGE	
W_01, W_04, W_05, W_06	Conventional lecture	Test / Written test	Examination card / Grade card
W_02, W_03	Conventional lecture, Laboratory classes	Exam / Written Test, Test / Written test, Presentation	Examination card / Grade card, Evaluated written paper, Evaluated test / written test, Protocol / paper printout/ paper file
		SKILLS	
U_01	Laboratory classes, Practical classes	Test of practical skills	Evaluated test / written test, Protocol / paper printout/ paper file
U_02	Conversational Lecture, Practical classes	Test of practical skills	Evaluated test / written test
U_03	Conversational Lecture, Practical classes	Test of practical skills	Evaluated test / written test
		SOCIAL COMPETENCIES	
K_01	Conversational Lecture, Practical classes	Exam / Written Test, Test of practical skills	Examination card / Grade card, Evaluated test / written test, Protocol / paper printout/ paper

			file
K_02	Work in Pairs (Think-Pair-Share)	Test of practical skills	Evaluated written paper, Evaluated test / written test, Protocol / paper printout/ paper file

VI. Grading criteria, weighting factors.....

The condition for passing the exercises is the presence of the student at the classes, the execution of the exercises and receiving grades, obtaining a positive grade in written tests.

The exam (for those who passed the exercises) consists in carrying out a test of the knowledge provided during the lecture. The examination grade is formed on the basis of two components:
60% - written answers to test tasks and oral answers in case of doubt,
40% - grade obtained from exercises.

Grading is performed on the following scale:
91 - 100% - very good (5.0),
81 - 90% - plus good (4.5),
71 - 80% - good (4.0),
61 - 70% - plus sufficient (3.5),
50 - 60% - sufficient (3.0),
below 50% - insufficient (2.0).
Detailed rules of assessment are given to students with each edition of the subject.

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	30
Number of hours of individual student work	Preparation for classes 5 Studying Literature 5 Preparation for the colloquium 5 Total number of hours 15

VIII. Literature

Basic literature
1. Hennessy, J.L., Patterson, D.A. Computer Architecture: A Quantitative Approach. 6th ed., Morgan-Kaufmann, 2018. 2. Andrew S. Tanenbaum. Structured Computer Organization (6th Edition), Helion, 2012 3. Stallings William. Computer organization and architecture (11th edition), 2018. 4. L. Null, J. Labur, The Essentials of Computer Organization and Architecture (3rd Edition), Helion, 2016 5. Melnyk A., Computer architecture. VOD, 2008
Additional literature
1. Melnyk A., Melnyk V. Personal Supercomputers. LPP, 2013. 2. J. Biernat, Arytmetyka komputerów, PWN, 1996 3. S. Gryś, Arytmetyka komputerów, PWN, 2007.