

**KARTA PRZEDMIOTU****I. Dane podstawowe**

Nazwa przedmiotu	Architektura komputera
Nazwa przedmiotu w języku angielskim	Computer architecture
Kierunek studiów	Informatyka
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	
Język wykładowy	angielski

Koordinator przedmiotu/osoba odpowiedzialna	Prof. Dr. Hab. Melnyk Anatolij
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Forma zajęć ( <i>katalog zamknięty ze słownika</i> )	Liczba godzin	semestr	Punkty ECTS
wykład	15	1	3
konwersatorium			
ćwiczenia			
laboratorium	15	1	
warsztaty			
seminarium			
proseminarium			
lektorat			
praktyki			
zajęcia terenowe			
pracownia dyplomowa			
translatorium			
wizyta studyjna			

Wymagania wstępne	mathematics and computer science at the high school level
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**II. Cele kształcenia dla przedmiotu**

1 - Transfer of knowledge about data representation in computer
2 - Transfer of knowledge about the computer building
3 - Transfer of knowledge about the computer general organization and functioning

### III. Efekty uczenia się dla przedmiotu wraz z odniesieniem do efektów kierunkowych

Symbol	Opis efektu przedmiotowego	Odniesienie do efektu kierunkowego
<b>WIEDZA</b>		
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 representation, performing operations on floating point 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
<b>UMIEJĘTNOŚCI</b>		
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, K_U06, K_U30
U_03	Student is able to create a simple program in assembler.	K_U04, K_U06, K_U30
<b>KOMPETENCJE SPOŁECZNE</b>		
K_01	Student is able to discuss the architecture of contemporary computer systems.	K_K01

### IV. Opis przedmiotu/ treści programowe

Program content of the course:

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, RISC, superscalar and vector architecture, VLIW processors, arithmetic-logic unit, control unit, multilevel memory organization.

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. Metody realizacji i weryfikacji efektów uczenia się

Symbol efektu	Metody dydaktyczne (lista wyboru)	Metody weryfikacji (lista wyboru)	Sposoby dokumentacji (lista wyboru)
<b>WIEDZA</b>			
W_01	- lecture with multimedia presentation, - discussion	test, colloquium, homework, preparation for classes	test, colloquium, homework
W_02	- lecture with multimedia presentation, - problem and dialogue methods, - teaching methods supported by information techniques, - working with text, - academic classes in laboratory equipped with projector	test, colloquium, homework, preparation for classes	test, colloquium, homework
W_03	- lecture with multimedia presentation, - individual work with student - problem and dialogue methods, - working with text, - group work, - academic classes in laboratory equipped with projector	test, colloquium, homework, preparation for classes	test, colloquium, homework
W_04	- lecture with multimedia presentation, - individual work with student - problem and dialogue methods, - teaching methods	test, colloquium, homework, preparation for classes	test, colloquium, homework

	supported by information techniques, - working with text, - academic classes in laboratory equipped with projector		
W_05	- lecture with multimedia presentation, - discussion, - individual work with student - problem and dialogue methods, - teaching methods supported by information techniques, - working with text, - group work, - academic classes in laboratory equipped with projector	test, colloquium, homework, preparation for classes	test, colloquium, homework
W_06	- lecture with multimedia presentation, - discussion, - individual work with student - problem and dialogue methods, - teaching methods supported by information techniques, - working with text, - group work, - academic classes in laboratory equipped with projector	test, colloquium, homework, preparation for classes	test, colloquium, homework
<b>UMIEJĘTNOŚCI</b>			
U_01	- lecture with multimedia presentation, - discussion, - individual work with student - problem and dialogue methods, - teaching methods supported by information techniques, - working with text, - group work, - academic classes in laboratory equipped with	test, colloquium, homework, preparation for classes	test, colloquium, homework

	projector		
U_02	<ul style="list-style-type: none"> <li>- lecture with multimedia presentation,</li> <li>- discussion,</li> <li>- individual work with student</li> <li>- problem and dialogue methods,</li> <li>- teaching methods supported by information techniques,</li> <li>- working with text,</li> <li>- group work,</li> <li>- academic classes in laboratory equipped with projector</li> </ul>	test, colloquium, homework, preparation for classes	test, colloquium, homework
U_03	<ul style="list-style-type: none"> <li>- lecture with multimedia presentation,</li> <li>- discussion,</li> <li>- individual work with student</li> <li>- problem and dialogue methods,</li> <li>- teaching methods supported by information techniques,</li> <li>- working with text,</li> <li>- group work,</li> <li>- academic classes in laboratory equipped with projector</li> </ul>	test, colloquium, homework, preparation for classes	test, colloquium, homework
<b>KOMPETENCJE SPOŁECZNE</b>			
K_01	<ul style="list-style-type: none"> <li>- lecture with multimedia presentation,</li> <li>- discussion,</li> <li>- individual work with student</li> <li>- problem and dialogue methods,</li> <li>- teaching methods supported by information techniques,</li> <li>- working with text,</li> <li>- group work,</li> <li>- academic classes in laboratory equipped with projector</li> </ul>	work and activity during classes	bonus points for activity

**VI. Kryteria oceny, wagi...**

The assessment criteria and ways of verifying the intended learning outcomes:  
 Passing classes - test (50% of the final grade) and homework (50% of final grade).

Written exam (for those who passed the exercises) in the form of a test of knowledge provided during the lecture.

Grading scale:

less than 50% insufficient (2.0)

Detailed assessment rules are given to students with each subject edition.

HOURLY EQUIVALENTS OF ECTS POINTS:

Hours implemented as part of the study program:

Lecture 15,

Exercises 15

Consultation 15

Preparation for classes 10

Studying literature 10

Preparation for tests and exam 10

Total number of hours 60

ECTS points 3

## VII. Obciążenie pracą studenta

Forma aktywności studenta	Liczba godzin
Liczba godzin kontaktowych z nauczycielem	<b>45</b>
Liczba godzin indywidualnej pracy studenta	<b>30</b>

## VIII. Literatura

Literatura podstawowa
1. Hennessy, J.L., Patterson, D.A. Computer Architecture: A Quantitative Approach. 5th ed., Morgan-Kaufmann, 2012.
2. Andrew S. Tanenbaum. Structured Computer Organization (6th Edition), Helion, 2012
3. Stallings William. Computer organization and architecture (8th edition), 2010.
4. L. Null, J. Labur, The Essentials of Computer Organization and Architecture (3rd Edition), Helion, 2016
5. Melnyk A., Computer architecture. VOD, 2008
Literatura uzupełniająca
1. Melnyk A., Melnyk V. Personal Supercomputers. LPP, 2013.
2. J. Biernat, Arytmetyka komputerów, PWN, 1996
3. S. Gryś, Arytmetyka komputerów, PWN, 2007.