Course title: **COMPUTER ORGANIZATION AND ARCHITECTURE**

ECTS credit allocation (and other scores): **3**

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English/Polish

Number of hours per semester: 30 lectures + 15 classes = 45 hours

Course coordinator/ Department and e-mail: Erasmus coordinator Anna Szczepkowska/ WMiI, erasmuswmii.uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES:

Haming codes. Minimization of boolean functions (usual 3-4 inputs, 1 output) and multi-output functions based on a 4-bit adder using Karnaugh Maps and a one-bit adder built from a half adder. Programming on the DSM-51 microcontroller. Stack architecture programming.

LECTURES:

The structure of a uniprocessor computer and its evolution since the 1960s. Computer arithmetic. IEEE Standard 754. System buses. Computer memory: main, cache, external (HDD, RAID, SSD). I/O: I/O modules, programmable I/O, interrupts, DMA. Instruction sets: properties and functions, types of operands and operations, addressing modes and instruction formats, Big-Endian and Little-Endian conventions. CPU structure and operation. Instruction Cycle. Pipelined instruction processing. RISC computers. Superscalar processors. x86 architecture.

Learning purpose:

Ability to answer the question: How does the computer work? Classifying computer systems. Determining the possibilities of increasing the performance of a computer system. Recognition of types of computer instructions. Understanding the principle of operation of methods and ways to increase computer performance.

On completion of the study programme the graduate will gain:

Knowledge:

The student has a structured knowledge of computer systems architecture, understands machine instruction execution basics, and logical connections between computer components and tasks.

Skills:

The student can identify and characterize the basic elements of computer systems and devices, explains the factors influencing the performance of the computer system, and identifies the types of commands and computer resources.

Social Competencies:

The student understands the need for continuous training and improving professional, personal and social competencies, the principles of computer technology development, and evaluates selected aspects of digitization on human impact.

Basic literature:

1. Andrew S. Tanenbaum, *Strukturalna organizacja systemów komputerowych*, Wyd. HELION, R. 2006, s. 864
2. Wiliam Stallings, *Organizacja i Architektura Systemu Komputerowego*, Wyd. WNT, R. 2004
3. Linda Null, Julia Lobur, *Struktura organizacyjna i architektura systemów komputerowych*, Wyd. HELION, R. 2004, s. 672

Supplementary literature:

1. David M. Harris, Sarah L. Harris, *Digital Design and Computer Architecture*, Wyd. Morgan Kaufmann, R. 2013

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1.85 ECTS points

Student's independent work: 1.15 ECTS points