UNIT ID:2324

Domain **COMPUTER SYSTEM SUPPORT**
Title: **Review computer organization and architecture**

Level: 3 **Credits: 10**

Purpose

This unit standard is intended for those who review computer organization and architecture .people credited with this unit standard are able to outline the history of computers, analyze bus architecture and digital logic, demonstrate an understanding of internal memory, and demonstrate an understanding of external memory, demonstrate an understanding of hardware operating system support, manipulate computer arithmetic, design instructional sets, analyze the difference between CPU, RISC architecture vs. CISC architecture, demonstrate an understanding of parallel processing and multicore.

This unit standard is intended for those who work as computer system supporters.

Special Notes

1. Entry information:

   Prerequisites:
   - None

2. This unit standard is to be delivered and assessed in the context of information and communication technology.

3. Assessment evidence may be collected from a real or a simulated workplace in which ICT operations are carried out.

4. *Glossary of terms*
   - *'History of computers hardware'* a period that covers the developments from simple devices to aid calculation, to mechanical calculators, punched card data processing and on to modern stored-program computers.
   - *'Bus*-a' subsystem that transfers data between computer components inside a computer or between computers
   - *'Digital Logic*' is the fundamental concept underpinning all modern computer systems. Put simply, it's the system of rules that allow us to make extremely complicated decisions based on relatively simple "yes/no" questions
   - *'Internal Memory'* is the primary storage or main memory directly accessible to the central processing unit (CPU) of a computer. It is also applicable to phones and digital televisions.
   - *'ASCII*' the American Code for Information Interchange is a character-encoding scheme originally based on the English alphabet that encodes 128 specified characters – the numbers 0-9, the letters a-z and A-Z, some basic punctuation

symbols, some control codes that originated with Teletype machines, and a blank space – into the 7-bit binary integers.

- *EDCDIC* (Extended Binary Coded Decimal Interchange Code) is an 8-bit character encoding used mainly on IBM mainframe and IBM midrange operating systems.
- *UNICODE*- is the universal character encoding standard used for representation of text for computer processing. Unicode provides a consistent way of encoding multilingual plain text making it easier to exchange text files internationally.
- *External Memory*-External memory is data storage that retains and synthesises data inside the computer. It is also called storage or memory. It includes computer components and recording media.
- *Operating System Support*- assistance given by software vendor on its software. It includes technical assistance and support
- *Instructional sets*- is the part of the computer architecture related to programming, including the native data types, instructions, registers, addressing modes, memory architecture, interrupt and exception handling, and external I/O.
- *CPU*- is the hardware within a computer that carries out the instructions of a computer program by performing the basic arithmetical, logical, and input/output operations of the system
- *RISC architecture*- is a type of microprocessor architecture that utilizes a small, highly-optimized set of instructions, rather than a more specialized set of instructions often found in other types of architectures
- *CISC architecture*-is a type of microprocessor architecture contains a large set of computer instructions that range from very simple to very complex and specialized.
- *Parallel Processing*- is the processing of program instructions by dividing them among multiple processors with the objective of running a program in less time
- *Multicore System*- is an integrated circuit (IC) to which two or more processors have been attached for enhanced performance, reduced power consumption, and more efficient simultaneous processing of multiple tasks

5. Performance of all elements in this unit standard must comply with industry standards.

6. Regulations and legislation relevant to this unit standard include the following:
   - Labour Act 2007(Act No 11, 2007).
   - Regulations relating to the health & safety of employees at work under schedule 1 (2) of the Labour Act No.11 of 2007 and all subsequent amendments.

Quality Assurance Requirements

This unit standard and others within this sub-field may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority onwww.namqa.org and the Namibia Training Authority onwww.nta.com.na

Elements and Performance Criteria

Element 1: Outline the history of computers

Performance Criteria

1.1 History of computers is described.

1.2 Computer generations (Milestones in Computer Architecture) are explained.

1.3 Computer systems structure, functions and operations are explained.

1.4 Computer architecture vs. computer organization is differentiated.

Element 2: Analyze bus architecture and digital logic

Range

Bus architecture may include but not be limited to, Individual Savings Account (ISA), Payment card industry (PCI), and Universal Serial Bus (USB).

Performance Criteria

2.1. Interconnections are explained.

2.2. Bus structure and elements of design are explained and illustrated.

2.3. Examples of buses, methods of arbitration, and timing and bus width are demonstrated.

Element 3: Demonstrate an understanding of internal memory

Range

Internal memory may include but is not limited to Byte (symbol: B), Kilobyte (KB or kB), Megabyte (MB), Gigabyte (GB) and Terabyte (TB).

Performance Criteria

3.1 Types of memory are explained according to specific task requirements.

3.2 Building blocks of memory are demonstrated and applied

3.3 Registers are explained and demonstrated

3.4 Cache memory principles are explained and illustrated.

Element 4: Demonstrate an understanding of external memory

Range

External memory devices may include but are not limited to hard drive (HDD), solid-state drive (SSD) and hybrid drive.

External memory configuration may include but is not limited to RAID.

Performance Criteria

4.1. Storage device characteristics are classified and selected in accordance with instructions.

4.2. Hard Disk storage is explained and performed.

4.3. Magnetic storage is explained and performed.

4.4 Optical mass storage devices are illustrated and storage options are selected.

4.5 Solid State Disk (SSD) is explained and demonstrated in accordance with the selected devices.

4.6 External memory configuration technologies are illustrated.

Element 5: Demonstrate an understanding of hardware operating system support

Performance Criteria

5.1. I/O modules are described and illustrated.

5.2. Interrupts are explained and performed.

5.3. Direct memory access is identified and illustrated according to instruction.

5.4. I/O channels and Processors are applied in accordance with selected devices.

5.5 External Devices are described and illustrated.

Element 6: Manipulate computer arithmetic

Performance Criteria

6.1. Number bases: Decimal, Binary, Octal, Hexadecimal are calculated.

6.2. Conversion between different number systems is identified.

6.3. Character Codes: ASCII, EDCDIC and UNICOSE are produced.

6.4. Integer representations are demonstrated.

Element 7: Design instructional sets

Performance Criteria

7.1. Elements of machine instructions are verified.

7.2. Instruction representation, instruction types and number of addresses are established.

7.3. Coordination of instruction set design, operations and operands are illustrated.

Element 8: Analyze the difference between CPU, RISC Architecture vs. CISC Architecture

Range

Complex Instruction Set Computing (CISC) architecture features may include but is not limited to Hardware, multi clock complex instructions, memory to memory: load to store incorporated instructions, small codes sizes, high cycles per seconds and transistors.

Reduced Instruction Set Computing (RISC) architecture features may include but are not limited to software, single-clock, and register to register: load and store independent instructions, low cycle per second, large code sizes and spends more transistors on memory registers.

Performance Criteria

8.1 Example of program execution is illustrated.

8.2 Interrupts are identified and measured.

8.3 Program flows of control with and without interrupts are estimated.

8.4 Instructional cycle with interrupts is demonstrated.

Element 9: Demonstrate an understanding of parallel processing and multicore systems

Range

Parallel hardware platforms may include but are not limited to symmetric multiprocessing systems, massively parallel processing systems, clustered systems and non-uniform memory access systems.

Advantages of parallel processing may include but is not limited to higher throughput, more fault tolerance, high availability, scale –up, speed up and better price/performance.

Multicore systems hardware may include but is not limited to two-cores (dual-core, core duo), four cores (quad-core - processor) six cores (hexa-core CPU'S), eight cores (octo-core), ten cores.

Performance Criteria

9.1 Architectural considerations, design and performance improvements of Parallel Processing is explained and demonstrated.

9.2 Architectural considerations, design and performance improvements of Multicore Computers is explained and illustrated.

Registration Data

Subfield:	Information and Communication Technology
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