Lecture 1

COAL (KCS-302)

UNIT-1

## Introduction

Functional units of digital systems and their interconnections, buses, bus architecture, types of buses and bus arbitrations. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and Addressing modes

---

CO1 Study of the basic structure and operation of digital computer system

---

Bloom's knowledge level [K1, K2]

UNIT-2

## Arithmetic and logic Unit

Look ahead carries adders. Multiplication of Signed operands multiplication, Booths algorithm and array multiplier. Divisions and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers.

---

CO2 Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.

---

Bloom's Knowledge Level [K2 K4]

# UNIT-3

**Control Unit:**

Instruction types, formats, instruction cycles and sub cycles (fetch and execution etc), micro operations, execution of a complete instruction. Program control, Reduced Instruction set computer, Pipelining. Hardware and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.

---

CO3 Implementation of Control Unit techniques and the concept of Pipelining

---

Bloom's knowledge level [K3]

COA (KCS 502)

# UNIT-4

## Memory:

Basic concept and hierarchy, semiconductor RAM memories, 2D and 2 1/2 D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept implementation

---

CO4 Understanding the hierarchical memory system, cache memories and virtual memory

---

Bloom's knowledge level [K2]

# UNIT-5

## Input/Output

Peripheral devices, I/O Interface, I/O ports, Interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Program I/O, interrupt initiated I/O and Direct Memory Access, I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard Communication interfaces.

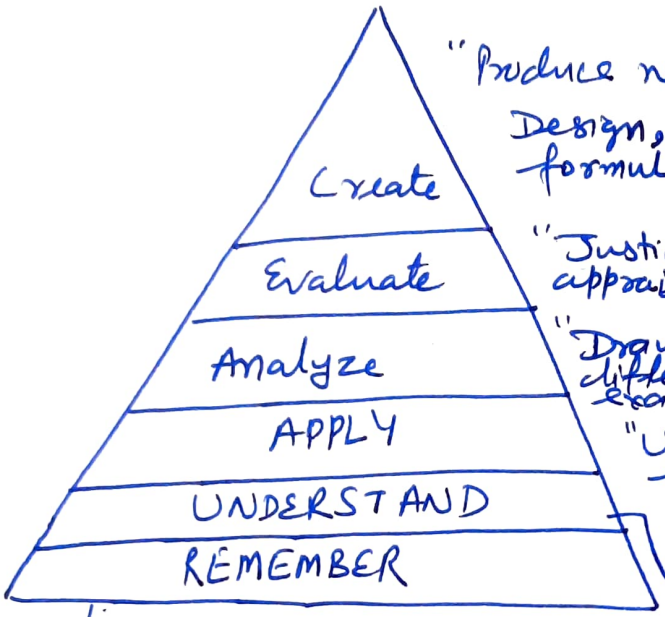
---

CO5 Understanding the different ways of communicating with I/O devices and standard I/O Interfaces

---

Bloom's Knowledge Level [K2, K4]

# Bloom's Taxonomy




"Produce new or original work"
Design, assemble, construct, conjecture, develop, formulate, author, investigate

"Justice a stand or decision"
appraise, argue, defend, judge, select, support, value,

"Draw connections among ideas"
differentiate organize, relate, compare, contrast, examine, experiment, question

"Use Information in new situation"
execute, implementation, solve, use, demonstrate, interpret, operate, schedule, sketch

→ Explain ideas or concepts
classify, describe, discuss, explain, identify, locate recognize, report, select, translate

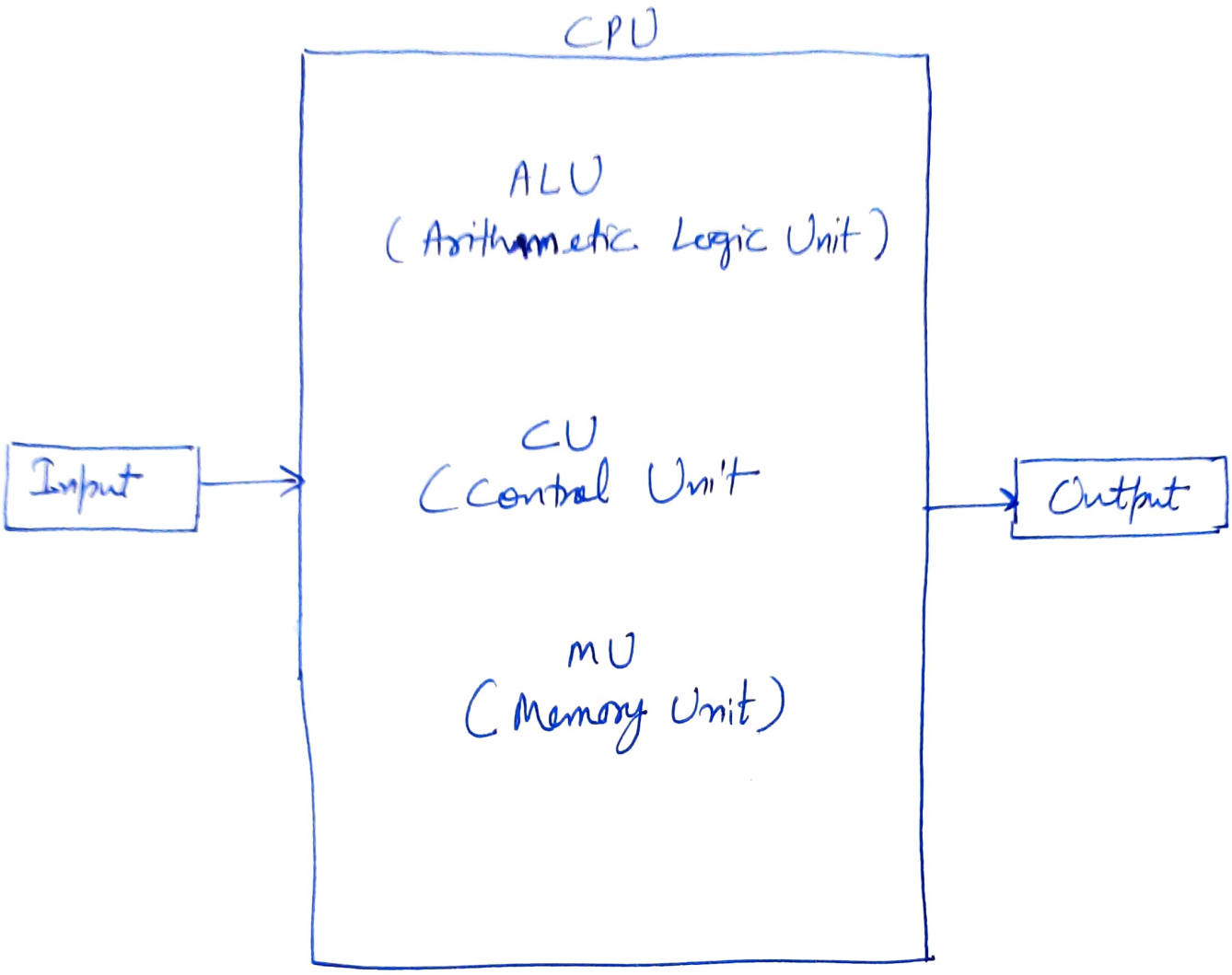
→ Recall facts and basic concepts
define, duplicate, list, memorize, repeat state

# UNIT-1

## § Functional Units of Degital System and their inter-connections:

# Computer: A computer is a combination of hardware and software resources which integrated together and provides various functionalities to the user. Hardware are the physical components of a computer like the processor, memory devices, monitor, keyboard etc. While software is the set of programs or instructions that are required by the hardware resources to function properly. There are a few basic components that aids the working-cycle of computer i.e. the input process - Output cycle and these are called as the functional components of a computer. It needs certain input, processes that input and produces the desired output. The input unit takes the input, the central processing unit does the processing of data and the output unit produces the output. The memory unit holds the data and instructions during the processing.

# Digital Computer: A digital computer can be defined as a programmable machine which reads the binary data passes as instructions, processes the binary data, and displays a calculated digital output. Therefore, digital computers are those that work on the digital data.




- Input Unit: The input consits of unit devices that are attached to the computer. These devices take input and convert it into binary language that the computer understands. Some of the common input devices are keywords, mouse, joystick, scanner etc.
- Central Processing Unit (CPU): Once the information is entered into the computer by the input device, the processor processes it. The CPU is called brain of the computer because it is the control center of the computer. It first fetches instructions from memory and then interprets them so as to know what is to be done. If required, data is fetched from memory

or input devices. Therefore CPU executes or performs the required computation and then either stores the output or displays on the output device. The CPU has three main components which are responsible for different functions - Arithmetic Logic Unit (ALU), Control Unit (CU) and Memory register.

- Arithmetic and Logic Unit (ALU): The ALU, as its name suggests performs mathematical calculations and takes logic decisions. Arithmetic calculations including addition, substraction, multiplication and division. Logical decisions involve comparison of two data items to see which one is larger or smaller or equal.

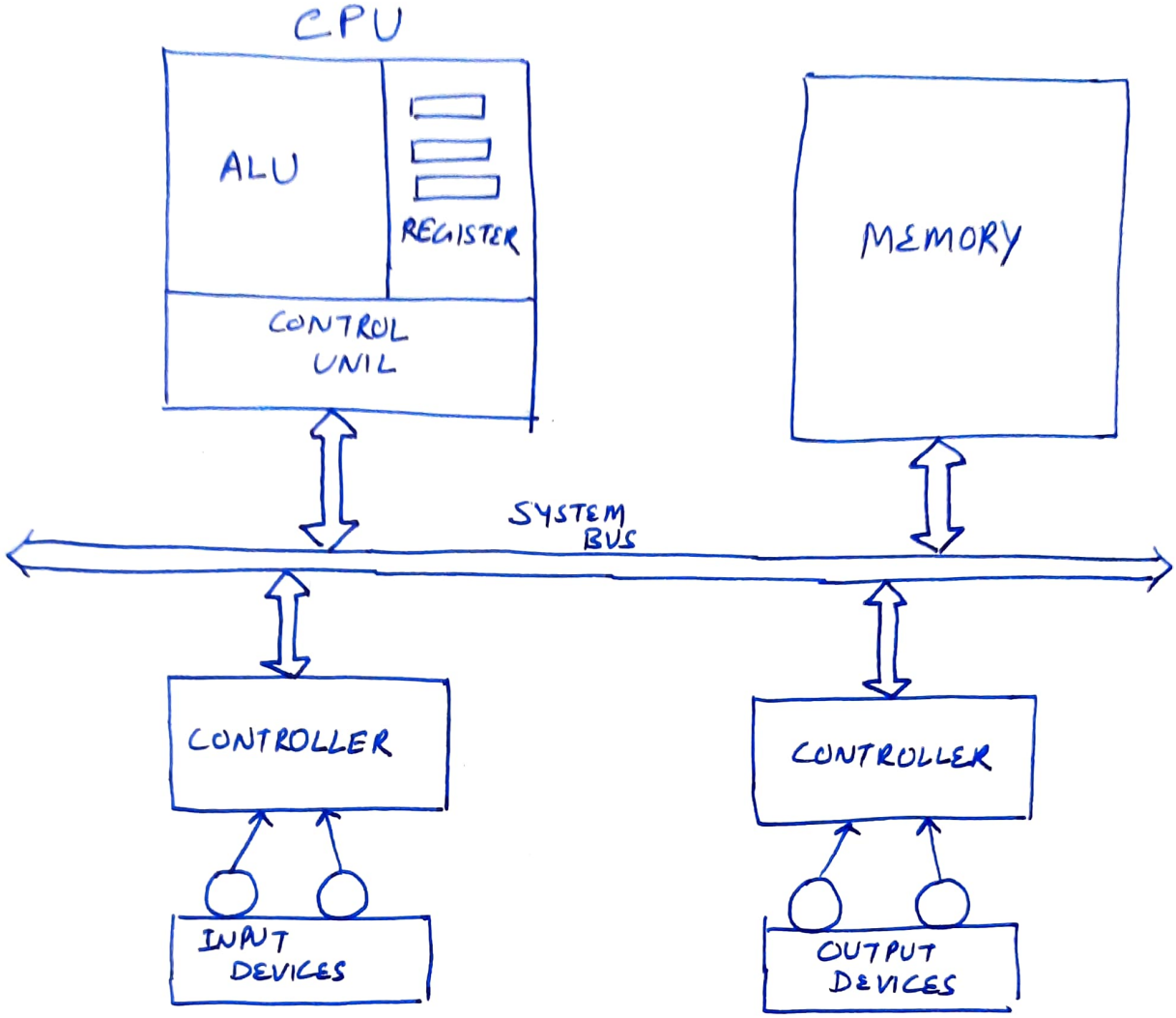
- Control Unit:- The control unit coordinates and controls the data flow in and out of CPU and also controls all the operations of ALU, memory registers and also input/output units. It is also responsible for carrying out of instructions stored in the program. It decodes the fetch instructions, interprets it and sends control signals to input/output devices until the required operation is done properly by ALU and memory.

- Memory Register:- A register is temporary unit of memory in the CPU. These are used to store the data which is directly used by the processor.

- Memory:- Memory attached to the CPU is used for storage of data and instructions and is called internal memory. Memory in detail (Unit 4).

- Output: The output unit consists of output devices that are attached with the computer. They are monitor, printer, plotter etc.

# Interconnection between functional Components:




A computer consists of input unit that takes input, a CPU that processes the input and an output unit that produces output. All these devices communicate with each other through a common bus.

The bus can be of three types

- Address bus
- Data bus
- Control bus