



**Al-Mustaqbal University**

**College of Science**

**Artificial Intelligence Sciences Department**

## **Lecture1**

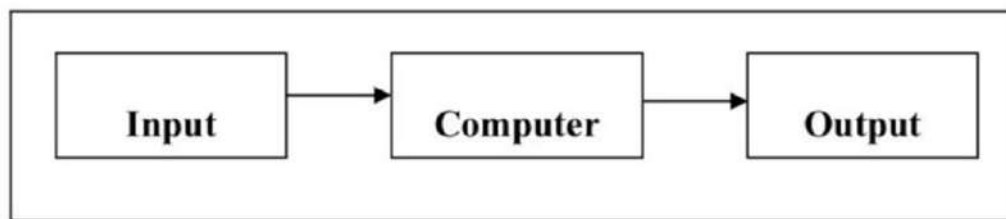
# **Computer Organization and Logic Design**

**M.S.C. Fatima Ayad**

# Computer Organization

## 1. Computer Organization

**Computer:** - electronic device that accepts input, stores large quantities of data, execute complex instructions which direct it to perform mathematical and logical operations and outputs the answers in a human readable form. (See fig. 1)



**Fig (1) simple model of a computer**

### Advantages of computer system:

- 1- Store and retrieve large quantities of data.
- 2- The speed is faster than in any other form of data processing.
- 3- A single computer can perform a wide variety of activities as directed by a set of instructions (program).
- 4- Once data and instructions are fed into the computer, processing is continuous with a minimum of human intervention.
- 5- Data and programs may be stored inside the computer indefinitely and be retrieved quickly.
- 6- Accuracy is greater than any other system.

## **2. Computer History**

The Computer generation:

- 1- The first generation from 1946 to 1958 used electronic valves and frequent breakdowns and a rise in temperature due to the large size and weight. Use complex programming language.
- 2- The second generation from 1958 to 1964 used transistors instead valves, small size, low cost, and high speed. Use high programming language.
- 3- The third generation from 1965 to 1970 used complete circuit electronic, high speed, accuracy operations, and uses more users. Use high programming language.
- 4- The fourth generation from 1971 to 1980 used complete circuit electronic involve large number of transistors, small size, high speed in save data and information.
- 5- The fifth generation from 1980 to 1997 use complete circuit electronic very large and very high speed. As personal computer (PC), supper computer, and use artificial intelligent.

## **3. Computer Classification**

Types of computers on the basis of Technology

- Analog Computers: Analog Computer is a computing device that works on continuous range of values. The results given by the analog computers will only be approximate since they deal with quantities that vary continuously. It generally deals with physical variables such as voltage, pressure, temperature, speed, etc.
- Digital Computers A digital computer operates on digital data such as numbers. It uses binary number system in which there are only two digits 0 and 1 .

The digital computer is designed using digital circuits in which there are two levels for an input or output signal . These two levels are known as logic 0 and logic 1 .Digital Computers can give more accurate and faster results.

- Hybrid Computers A hybrid computer combines the desirable features of analog and digital computers. It is mostly used for automatic operations of complicated physical processes and machines.

## **4. Computer Structure**

Computer system is made of two main parts: -

### **1. Hardware:**

Hardware includes all the physical components of a computer that you can touch, such as the keyboard, screen, and speakers.

#### **□ Main components of hardware:**

##### **1- Input units**

**2-Central Processing Unit (CPU):** which consists of control unit. , Arithmetic and logic unit, and Register

##### **3- Output unit**

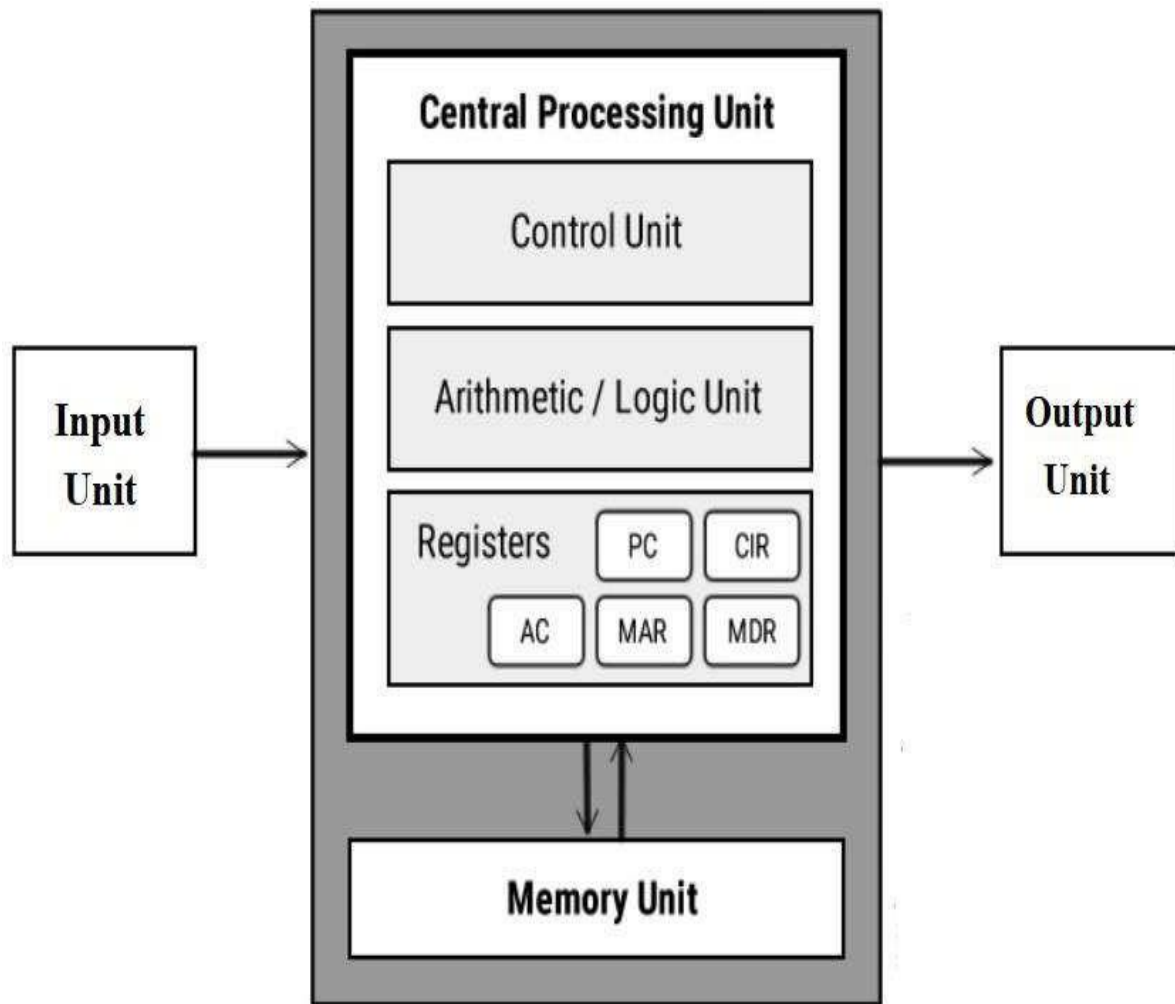
##### **4-Memory unit (internal memory).**

##### **5-External storage.**

2-**Software:** refers to programs, languages, and instructions that make the hardware work for us.

**Types of software:**

- **Operating Systems (OS):** Such as Windows, macOS, and Linux.
- **Applications:** Such as Microsoft Word, web browsers, and games.



**Fig (2) the logical structure of a computer**

**1-Input unit:** the input unit of a computer system accepts data, convert it into electrical impulses that are sent in to internal memory or to the central processing unit (CPU) where can be processed. Such as keyboard, mouse and other devices.

**2-Central processing unit (CPU):** The brain of any computer system is the CPU, which is sometime called “Processor” or “Microprocessor” in personal computer. The CPU supervises and controls all of the peripheral equipment; perform arithmetic and makes logical decisions. The CPU is responsible for includes the data movement computations and logical operation necessary to convert data into meaningful information.

It is divided into three sections:

### **1.1 Arithmetic and Logic unit (ALU).**

### **1.2 Control unit.**

### **1.3 Register.**

#### **1.1 Arithmetic and Logic unit (ALU): -**

Perform the processing of data including arithmetic operations such as addition, subtraction, multiplication, division and logic operations including comparison (ex.  $A < B$ ) and sorting.

#### **1.2 Control Unit.:**

It regulates the flow of data and instructions between different components such as memory, the arithmetic and logic unit (ALU), and input/output devices, and supervises the execution of instructions step by step.

#### **1.3 Register:**

Register are devices capable of storing information, receiving data from other areas within the computer and transferring information as directed by the control unit,

it is used for temporary storage of data or instruction and the most important register are: -

a-Program counter (PC): It contains the address of the next instruction to be executed.

b-Instruction Register (IR): It contains the instruction being executed.

c-Address Register (AR): holds the address of memory location.

d-Data Register (DR): Holds data that is being transferred to or from memory.

e-Accumulator (AC): Where intermediate arithmetic and logic results are stored.

### **3-Output unit:**

Output units are instruments of interpretation and communication between human and computer that let you see. the result of the commands you enter, the most common output device are a display screen (monitor), printer or other device that let you see.