جامعة المستقبل
كلية التقنيات الصحية والطبية
قسم تقنيات البصريات

Principles of computers

First stage

Lecture

Computer Components

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Computer hardware:

Computer hardware refers to the physical components that make up computer system, such as the case, central processing unit (CPU), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard.

Software:

is a set of instructions and documentation that tells a computer what to do or how to perform a task. Software includes all different programs on a computer, such as applications and the operating system.

Applications: are programs that are designed to perform a specific operation.
operating system: we will be talking about it later.

List of computer hardware:

- Motherboard
- Video
- Sound card
- Hard drive
- Optical drive
- USB ports
- Power supply

Motherboard:

The motherboard is the main component of a computer. It is a board with integrated circuitry that connects the other parts of the computer including the CPU, Primary Memory, Secondary Memory.

central processing unit (CPU):

is the electronic circuitry within a computer that executes instructions that make up a computer program, Or is the computer component that's responsible for interpreting most of the commands from the computers other hardware and software also called a central processor, main processor or just processor.

The CPU is comprised of three main parts:

1- Arithmetic Logic Unit (ALU): Executes all arithmetic and logical operations. Arithmetic calculations like as addition, subtraction, multiplication and division. Logical operation like compare numbers, letters, or special characters.

2- Control Unit (CU): directs the operation of the processor. It tells the computer's memory, arithmetic logic unit and input and output devices how to respond to the instructions that have been sent to the processor.

3- Registers: Stores the data that is to be executed next.

Primary Memory:

Random-access memory (RAM): Is the physical hardware inside a computer that temporarily stores data, serving as the computer working memory.

additional RAM allows a computer to work with more

information at the same time, which usually has a dramatic effect on total system performance.

Read-only memory (ROM): is a permanent form of storage. ROOM stays active regardless of whether power supply to it is turned on or off. ROM devices do not allow data stored on them to be modified.

Secondary Memory:

1- Hard drive

2- Optical Disk

3- Flash Disk

The generations of computers.

This section traces the history of computers from their mechanical era. Our treatment is very brief.

Generations of Computer	Time-Period	Evolving Hardware
First Generation	1940s – 1950s	Vacuum Tube Based
Second Generation	1950s – 1960s	Transistor Based
Third Generation	1960s – 1970s	Integrated Circuit Based
Fourth Generation	1970s – Present	Microprocessor Based
Fifth Generation	Present – Future	Artificial Intelligence Based

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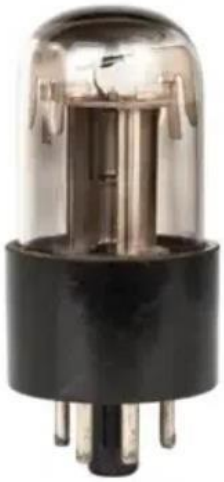
First Generation Computers

The technology behind the primary generation computers was a fragile glass device, which was called a vacuum tube. These computers were very heavy and really large. These weren't very reliable and programming on them was a tedious task as they used low-level programming language and used no OS. First-generation computers were used for calculation, storage, and control purpose. They were too bulky and large that they needed a full room and consume a lot of electricity. Punch cards were used for improving the information for external storage. Magnetic card used. Machine and assembly language is

developed.



Vacuum Tube

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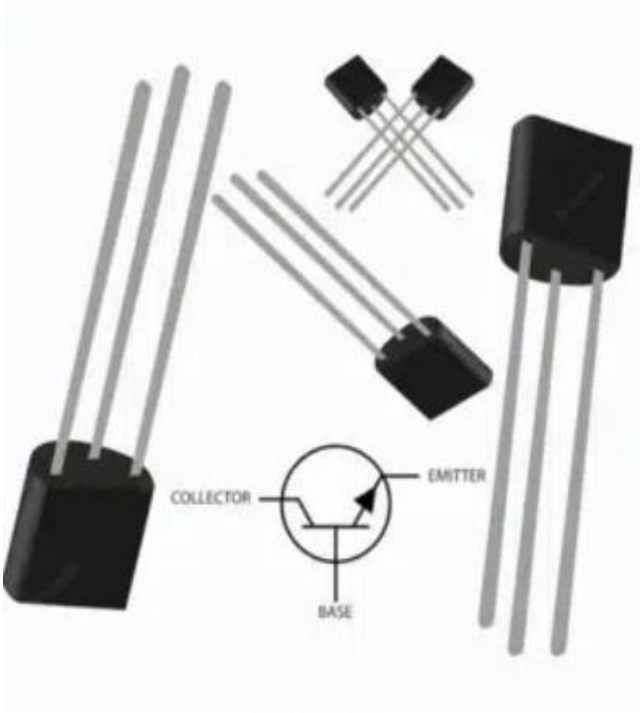
Second Generation Computers

Second-generation computers used the technology of transistors rather than bulky vacuum tubes. Another feature was the core storage. A transistor may be a device composed of semiconductor material that amplifies a sign or opens or closes a circuit.

Transistors were invented in Bell Labs. The use of transistors made it possible to perform powerfully and with due speed. It reduced the dimensions and price and thankfully the warmth too, which was generated by vacuum tubes. Central Processing Unit (CPU), memory, programming language, and input, and output units also came into the force within the second generation.

The programming language was shifted from high level to programming language and made programming comparatively a simple task for programmers. Languages used for programming during this era were FORTRAN (1956), ALGOL (1958), and COBOL (1959).



Transistor

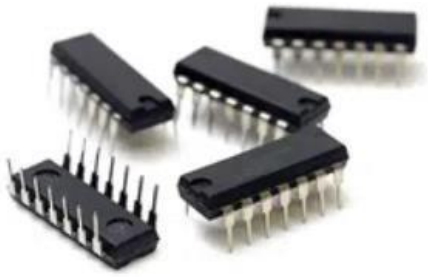
Third Generation Computers

During the third generation, technology envisaged a shift from huge transistors to integrated circuits, also referred to as IC. Here a variety of transistors were placed on silicon chips, called semiconductors. The most feature of this era's computer was speed and reliability. IC was made from silicon and also called silicon chips.

The computer programs was designed to make the machine work. Operating system was a program designed to handle a machine completely. Because of the operating system machine could execute multiple jobs simultaneously. Integrated circuits were used to replace many transistors used in the second generation.

A single IC has many transistors, registers, and capacitors built on one thin slice of silicon. The value size was reduced and memory space and dealing efficiency were increased during this generation. Programming was now wiped-out Higher-level languages like BASIC (Beginners All-purpose Symbolic Instruction Code). Minicomputers find their shape

during this era.



Integrated Circuit

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Fourth Generation Computers

In 1971 First microprocessors were used, the large-scale of integration LSI circuits built on one chip called microprocessors. The advantage of this technology is that one microprocessor can contain all the circuits required to perform arithmetic, logic, and control functions on one chip. LSI placed thousands of transistors onto a single chip.

The computers using microchips were called microcomputers. This generation provided even smaller size of computers, with larger capacities. That's not enough, then Very Large Scale Integrated (VLSI) circuits replaced LSI circuits. The Intel 4004 chip, developed in 1971, located all the components of the pc

from the central processing unit and memory to input/ output controls on one chip and allowed the dimensions to reduce drastically. VLSI placed several hundred thousand transistors on a single silicon chip. This silicon chip is known as the microprocessor.

Technologies like multiprocessing, multiprogramming, time-sharing, operating speed, and virtual memory made it a more user-friendly and customary device. The concept of private computers and computer networks came into being within the fourth generation.

Microprocessor

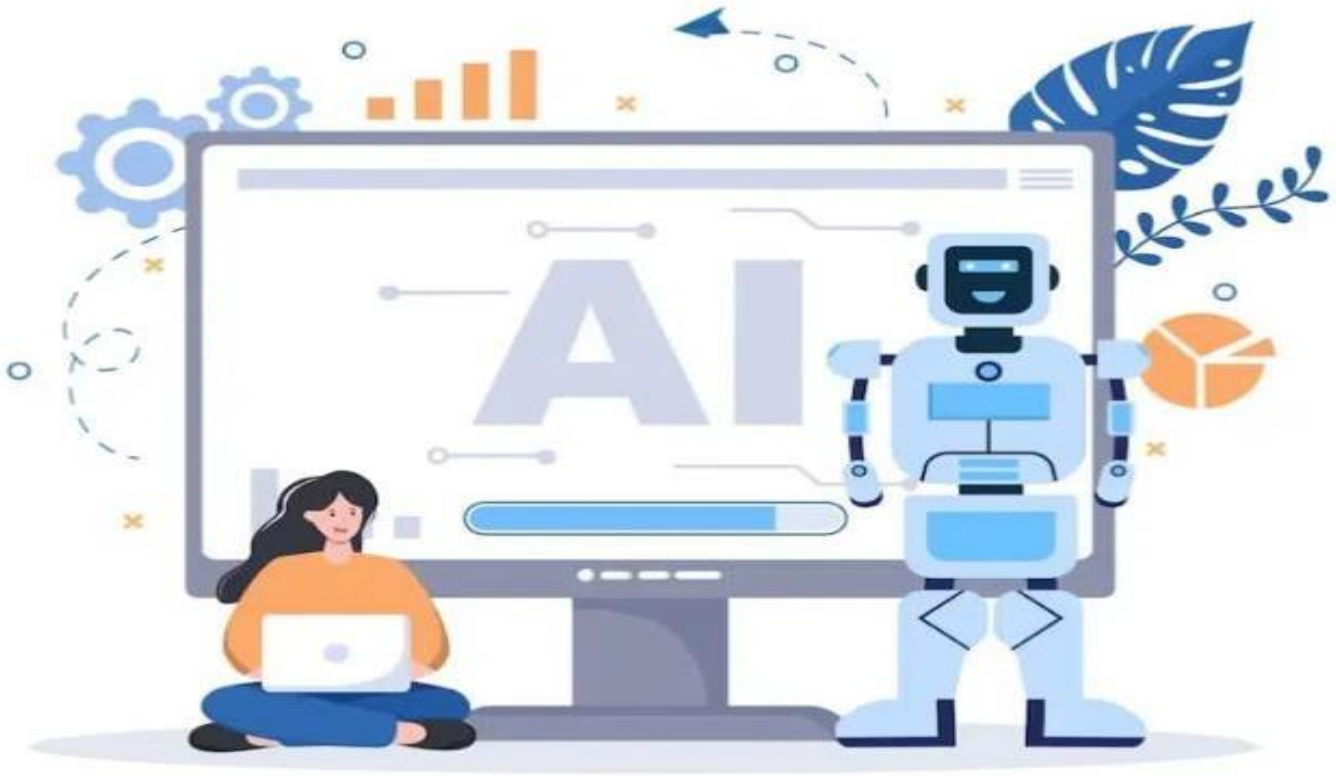
Fifth Generation Computers

The technology behind the fifth generation of computers is AI. It allows computers to behave like humans. It is often seen in programs like voice recognition, area of medicine, and entertainment. Within the field of game playing also it's shown remarkable performance where computers are capable of beating human competitors.

The speed is the highest, size is the smallest and area of use has remarkably increased within the fifth-generation computers. Though not a hundred percent AI has been achieved to date but keeping in sight the present developments, it is often said that this dream also will become a reality very soon.

To summarize the features of varied generations of computers, it is often

said that a big improvement has been seen so far because of the speed and accuracy of functioning care, but if we mention the dimensions, it's been small over the years. The value is additionally diminishing and reliability is increasing.



AI-Based Computers

Basic Terms Related to Computers

The basic terms related to generations of computers are listed below.

1. **Vacuum Tube:** Vacuum tubes have the functionality of controlling the flow of electronics in a vacuum. Generally, it is used in switches, amplifiers, radios, televisions, etc.
2. **Transistor:** A transistor helps in controlling the flow of electricity in devices, it works as an amplifier or a switch.
3. **Integrated Circuit (IC):** Integrated circuits are silicon chips that contain their circuit elements like transistors, resistors, etc.
4. **Microprocessors:** Microprocessors are the components that contain the CPU and its circuits and are present in the Integrated Circuit.
5. **Central Processing Unit (CPU):** The CPU is called the brain of the computer. CPU performs processing and **Magnetic Drum:** Magnetic Drum is like a cylinder that stores data and cylinder.
6. **Magnetic Core:** Magnetic cores are used to store information. These are arrays of small rings.
7. **Machine Language:** Machine Language is the language that a computer accepts (in the form of binary digits). It is also called low- level programming language.
8. **Memory:** Memory is used to store data, information, and program in a computer.
9. **Artificial Intelligence:** Artificial Intelligence deals with creating intelligent machines and behaviors
10. operations work.