

Note:

- 1) modem's transfer rate  
bits/s (Gbps)
- 2) data storage byte
- 3) clock speed GHz

## Lecture 2

Note:

Kilo  $\rightarrow 10^3$   
 mega  $\rightarrow 10^6$   
 giga  $\rightarrow 10^9$   
 tera  $\rightarrow 10^{12}$

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usually

- \* Computers work with binary numbers

bit  
 $0 \rightarrow \text{off}$   
 $1 \rightarrow \text{on}$

0V  $\leftarrow 0$   
 +5V  $\leftarrow 1$

Note:

### In 2's complement

-8	4	2	1		-8	4	2	1
(+ve) $\rightarrow$	0				Max. $\rightarrow (0\ 1\ 1\ 1)_2$			
(-ve) $\rightarrow$	1				Min. $\rightarrow (1\ 0\ 0\ 0)_2$			

Byte = 8 bits

signify a single unit of storage.

- \* The smallest piece of data a computer can work with is bit.

- \* The common measurement of a modem's data transfer rate is in bits/s such as Gbps "gigabits/s"

Gb  $\rightarrow$  Giga bit

GB  $\rightarrow$  Giga Bytes

- \* The common measurement of data storage is in byte such as GB "gigabyte"

### Floating point notation:

- Has no fixed number of digits before or after a decimal point.
- Enables a computer to work speedily with very large or small numbers.
- Requires special processing circuitry.

## Characters

letters, numbers & symbols → Character code → numbers the computer can understand

- \* Three main types of character coding:

- 1) American standard code for information interchange

( ASCII ) ←  
( English only )

1 Byte = 8 bits

- ## 2) Extended binary Coded Decimal interchange Code

(EBCDID) ←

↳ alphabetic  
↳ numeric

- 3) Unicode Transformation format (UTF) ↵

(all characters) of all languages) they're numeric characters  
of alphabetic characters

$$2 \text{ Bytes} = 16 \text{ bits}$$

- \* The system unit is the case that contains the major hardware components of a computer.

- \* System units come in different styles and have varying footprints the amount of space the unit uses.

- \* Footprints is the amount of space the unit uses 

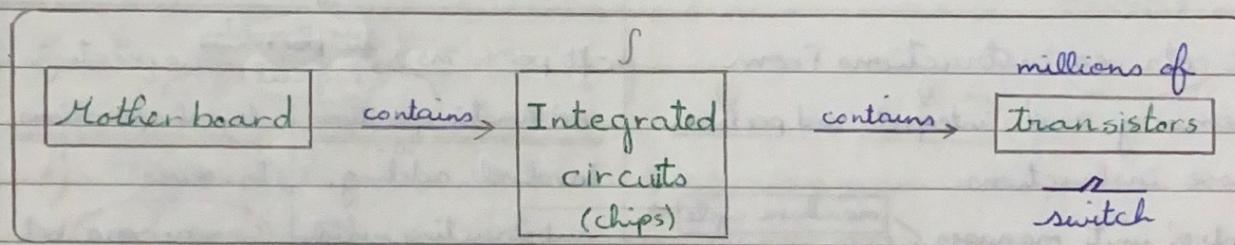
- \* Some units have embedded biometric authentication devices.

- \* System units vary in their form factor, which specifies how internal components are located within the system unit -

## \* System unit main components:

- Motherboard → The main circuit board. Internal speaker.
- CPU.
- Power supply.
- Cooling fan.
- Drive bays -
- Expansion slots -

\* The motherboard is the printed circuit board that contains the electric circuitry for the computer.



\* The majority of parts found on the motherboards are integrated circuits.

\* An integrated circuits (chip) includes million of transistors and carries electrical current.

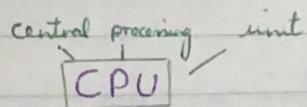
\* A transistor is a switch that is able to control the electrical signal flow to circuit

\* The integrated circuit chip that processes electronic signals is called central processing unit (CPU).

\* CPU is known as micro processor or processor.

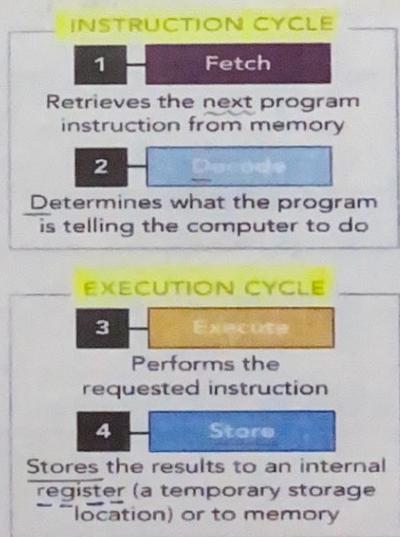
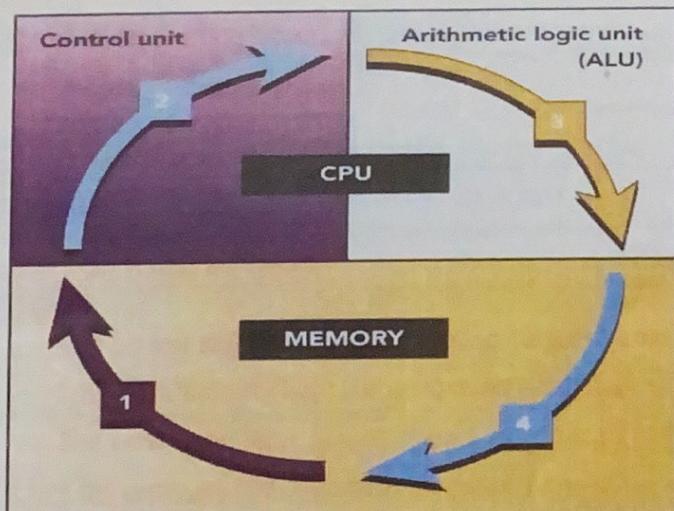
\* Each operation performed by the CPU is assigned a specific number, called an instruction.

\* An instruction set is the list of CPU instructions for the operations that it performs.



Control unit	Arithmetic logic unit (ALU)	
<ul style="list-style-type: none"> <li>- It retrieves instructions from memory and interprets and performs those instructions.</li> <li>- Control unit manages           <ul style="list-style-type: none"> <li>machine cycle</li> <li>processing cycle</li> </ul> </li> </ul>	<p>It performs</p> <ul style="list-style-type: none"> <li>Arithmetic operations</li> <li>Involves adding, subtracting, multiplying, dividing. (+, -, ×, ÷)</li> </ul>	<ul style="list-style-type: none"> <li>logical operations</li> <li>Involves comparisons bet. 2 or more items</li> </ul>

the 4 part process performed by CPU.



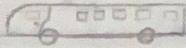
\* Register store data when it must be temporarily stored in the CPU.

\* Factors that affect the performance of a CPU include:

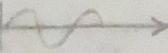
1) The number of existing transistors.

2) Data bus width and data size.

measured in bits



3) Clock speed



4) Operations per microprocessor cycle. (pipelining) if  $\rightarrow$  1 process at a time

5) Use of parallel processing

6) Type of chip

Define:

\* A Data bus is the group of parallel wires that connects the CPU's internal components.



\* Word size is the max. no. of bits the CPU can process at once.

2) It determines which operating systems and software a CPU can run.

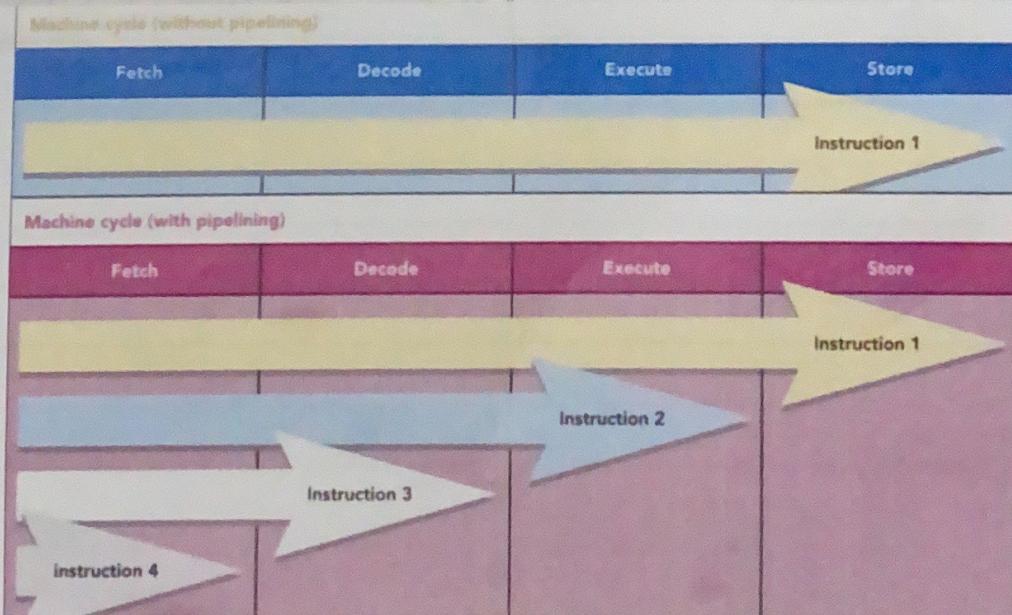
\* The system clock is an electronic circuit that produces rapid pulses and coordinates the computer's internal activities.

\* Clock speed is the measurement of the electrical pulses generated by the system unit. It is usually measured in giga Hertz (GHz).

- \* In general, the higher the clock speed, the faster the computer.
- \* The number of operations per tick of the system clock affects.

Pipelining	Parallel processing
<ul style="list-style-type: none"> <li>- Enables the CPU to process more than 1 instruction at a time which improves CPU performance.</li> </ul> <p>Pic. P.29</p>	<ul style="list-style-type: none"> <li>- It's a method in which more than 1 processor performs at the same time, resulting in faster processing.</li> </ul> <p>Pic. P.30</p>

Pipelining	Super scalar architecture
<ul style="list-style-type: none"> <li>- Enables the CPU to process more than 1 instruction at a time which improves CPU performance.</li> </ul>	<ul style="list-style-type: none"> <li>- Enables the CPU to perform more than 1 instruction for each clock cycle</li> </ul>

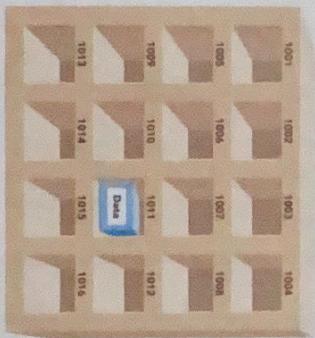


- \* The set of chips that collectively supply the switching circuitry the CPU requires to move data through out the computer is called the chipset.
- \* The CPU and the input/output bus are linked through the chipset.
- \* Input/output (I/O) bus provides a means to communicate input and output devices.

Cache memory	CPU reads then	RAM
<ul style="list-style-type: none"> <li>Volatile</li> </ul>		<ul style="list-style-type: none"> <li>Volatile.</li> </ul> <p>- Bec. its contents are erased when the computer is shut off.</p>

Cache memory	CPU reads then	RAM	ROM
<ul style="list-style-type: none"> <li>Primary cache</li> </ul> <p>- found in the micro-processor chip.</p> <p>Cache</p> <ul style="list-style-type: none"> <li>Secondary cache</li> </ul> <p>- located on the circuit board</p>		<ul style="list-style-type: none"> <li>Volatile.</li> </ul> <p>- Bec. its contents are erased when the computer is shut off.</p> <p>- Non-volatile</p> <p>- Bec. its contents are stored when CPU is turned off.</p>	

- RAM
- S-RAM      D-RAM
- "static RAM=cache RAM"      "Dynamic RAM"
- It's a small unit of fast memory built into the processor to improve performance.
  - It's more expensive than RAM.
  - Temporarily stores data and instructions to be used by the CPU.
  - Permits CPU to access or store data and instructions quickly quickly through RAM's memory address feature, which is a way to identify and locate stored data.



(8)

\* The front panel includes:

- 1) Power switch → to turn the computer on.
- 2) Drive activity light → advises the user that the hard drive is retrieving data.
- 3) Power-on light → shows whether or not the power is on.

Port	Connector
- It's an interface used to send data and retrieve data from the computer.	- A physical receptacle where the user can plug a peripheral device into the computer
- ex: USB port	- ex: telephone Jack

### Legacy technology:

- It's older technology that is being phased out.

- Ex:
  - Parallel port
  - Serial port
  - SCSI (small computer system interface ports).
  - PS/2 port.