



SNS COLLEGE OF ENGINEERING



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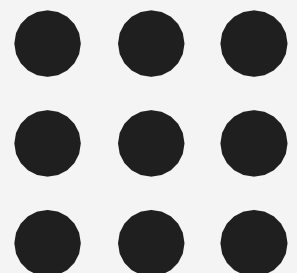
Department of Information Technology

**Course Name – 19IT301 Computer Organization and
Aechitecture**

II Year / III Semester

Unit 1 – Basic Structures of Computers

Topic :Functional Units



Functional Units

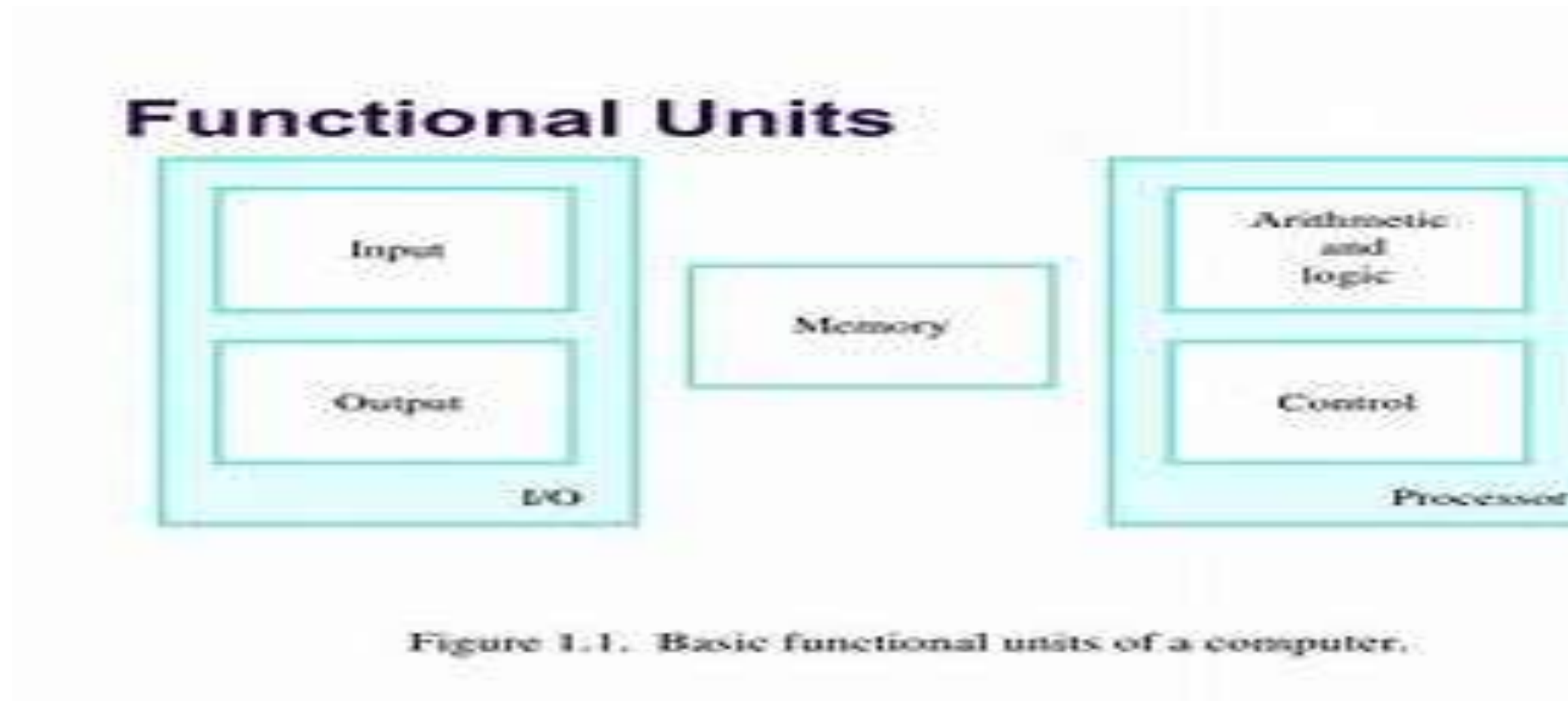


Figure 1.1. Basic functional units of a computer.



Information Handled by a Computer



Instructions/machine instructions

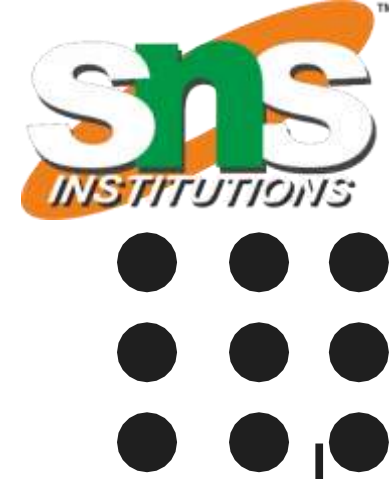
- Govern the transfer of information within a computer as well as between the computer and its I/O devices
- Specify the arithmetic and logic operations to be performed
- Program

Data

Used as operands by the instructions Source program



Memory Unit



- Store programs and data
- Two classes of storage

Primary storage

- Fast
- Programs must be stored in memory while they are being executed Large number of semiconductor storage cells
- Processed in words Address
- RAM and memory access time
- Memory hierarchy – cache, main memory
- **Secondary storage** – larger and cheaper



Arithmetic and Logic Unit (ALU)

- Most computer operations are executed in ALU of the processor.
- Load the operands into memory – bring them to the processor – perform operation in ALU – store the result back to memory or retain in the processor.
- Registers
- Fast control of ALU

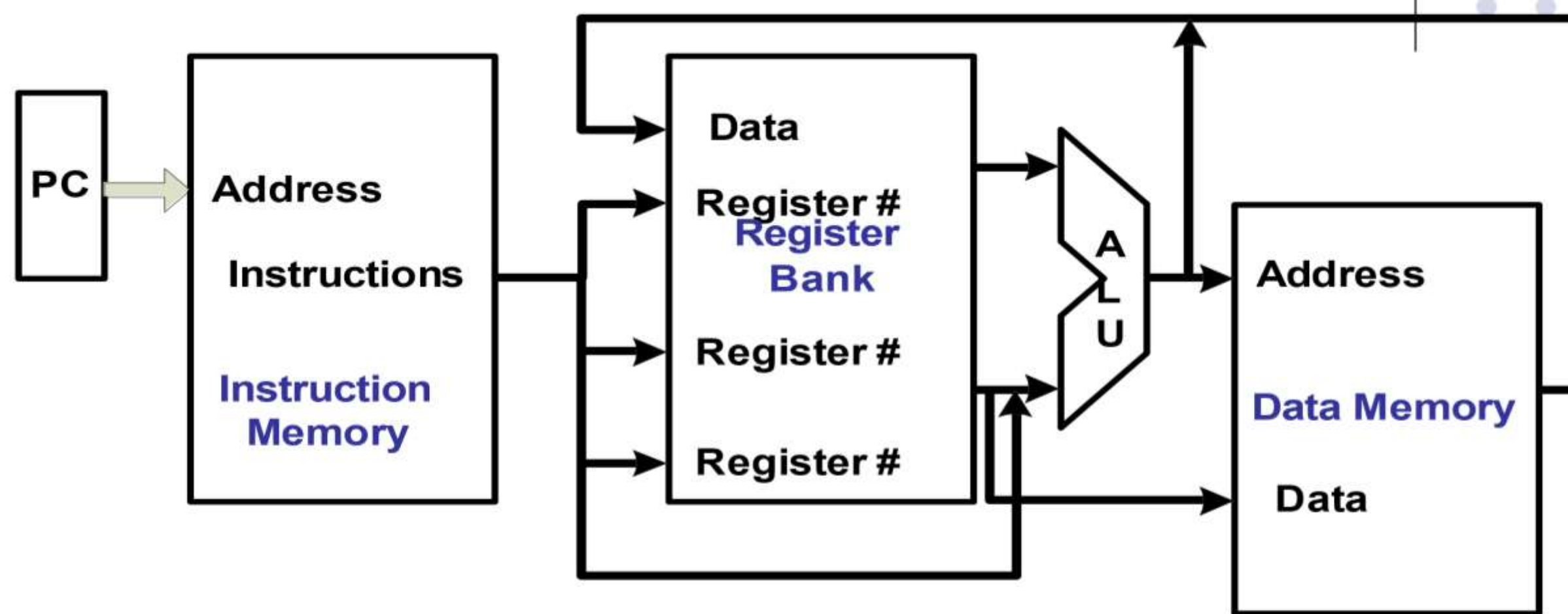


Control Unit



- All computer operations are controlled by the control unit.
- The timing signals that govern the I/O transfers are also generated by the control unit.
- Control unit is usually distributed throughout the machine instead of standing alone.
- Operations of a computer:
 - Accept information in the form of programs and data through an input unit and store it in the memory
 - Fetch the information stored in the memory, under program control, into an ALU, where the information is processed
 - Output the processed information through an output unit
- Control all activities inside the machine through a control unit

The processor : Data Path and Control



- Two types of functional units:
 - elements that operate on data values (combinational)
 - elements that contain state (state elements)

Instruction Execution Steps

| | | | | |
|---|--|---|----------------------------|---|
| | | | | |
| Instruction fetch | $IR = MEM[PC]$ $PC = PC + 4$ | | | |
| Instruction decode/register fetch | $A = Reg[IR[25-21]]$ $B = Reg[IR[20-16]]$ $ALUOut = PC + (signextend(IR[15-0]) \ll 2)$ | | | |
| Execution, address computation, branch/jump completion | $ALUOut = A \text{ op } B$ | $ALUOut = A + sign \text{ extend}(IR[15:0])$ | IF(A==B) Then PC=ALUOut | $PC = PC[31-28] \parallel (IR[25-0] \ll 2)$ |
| Memory access or R-type completion | $Reg[IR[15-11]] = ALUOut$ | Load: $MDR = Mem[ALUOut]$ or Store: $Mem[ALUOut] = B$ | | |
| Memory read completion | | Load: $Reg[IR[20-16]] = MDR$ | | |



THANK YOU