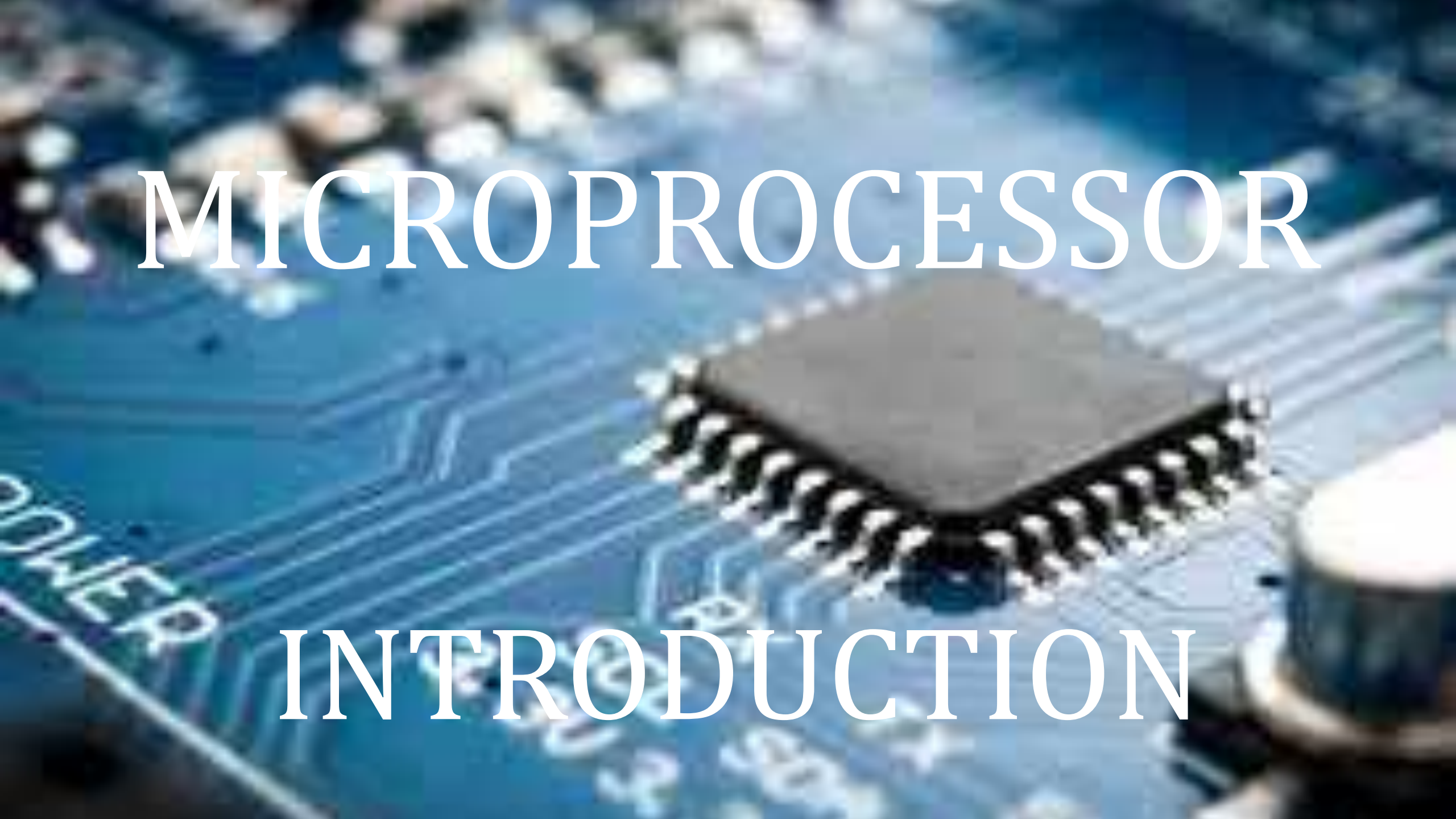
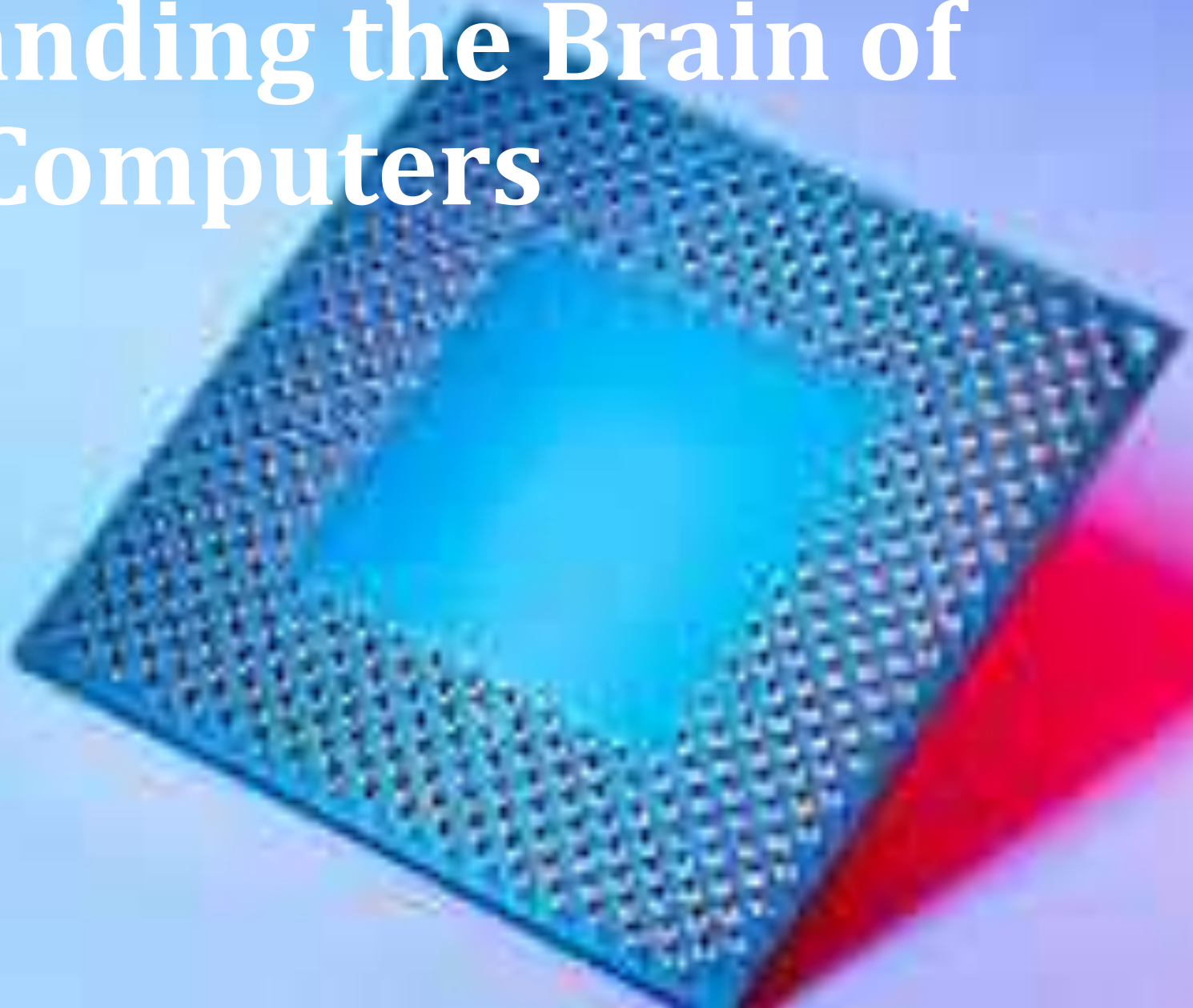


MICROPROCESSOR

INTRODUCTION

Understanding the Brain of Modern Computers



What is a Microprocessor?

- A microprocessor is an integrated circuit that contains the functions of a central processing unit (CPU) of a computer.
- **Key Functions:** Executes instructions, performs calculations, controls peripheral devices.

History of Microprocessors

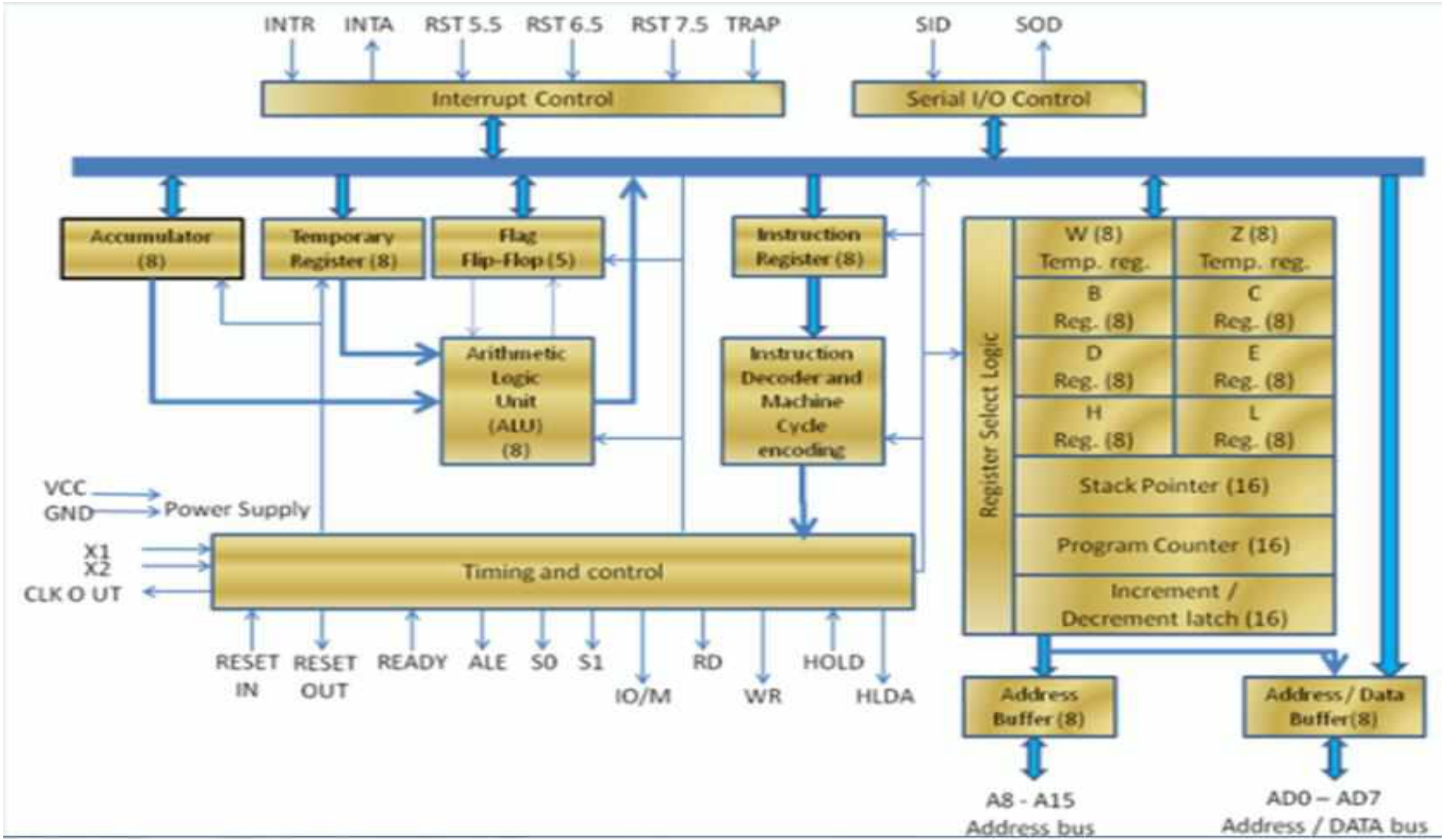
- **First Microprocessor:** Intel 4004, released in 1971.
- **Evolution:** From Intel 4004 to modern multi-core processors.
- **Milestones:** Intel 8080, Motorola 68000, Intel Pentium series, AMD Ryzen series.

How Microprocessors Work

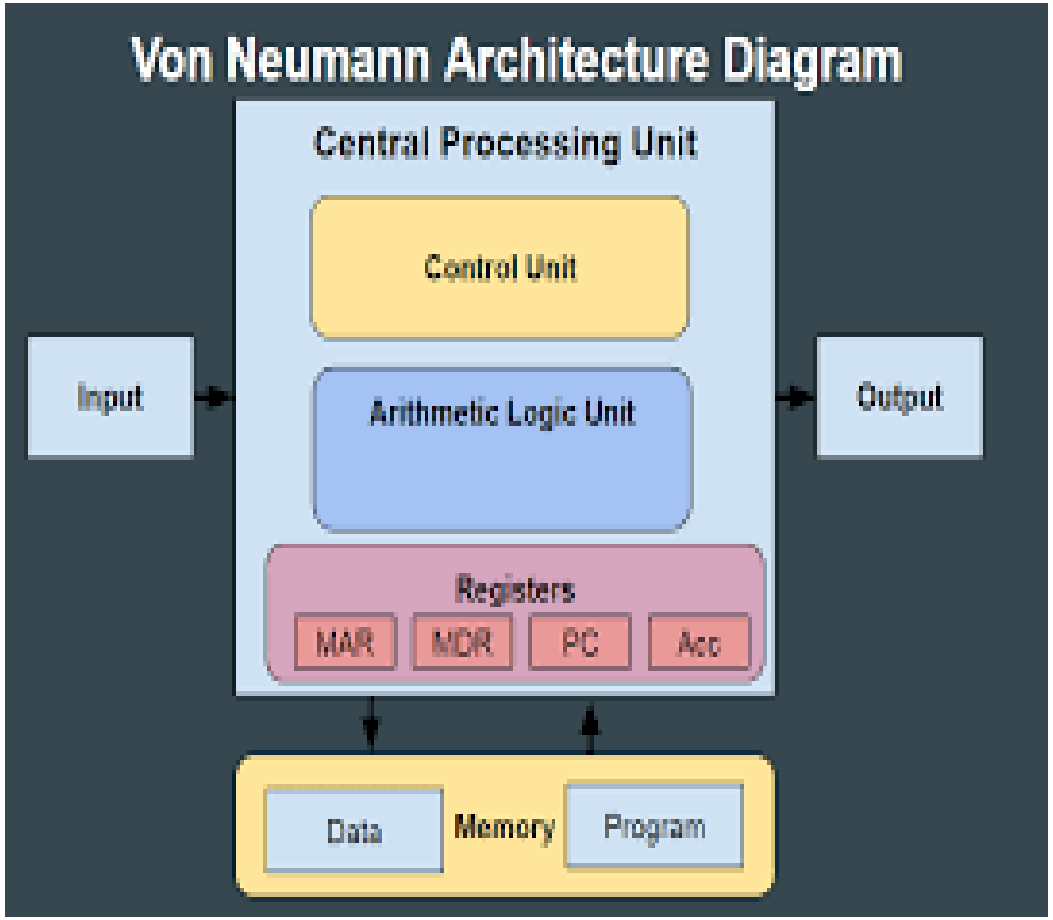
- **Fetch-Decode-Execute Cycle:**
  - **Fetch:** Retrieves instructions from memory.
  - **Decode:** Interprets the instructions.
  - **Execute:** Performs the instruction.
- **Components:** Control Unit (CU), Arithmetic Logic Unit (ALU), Registers, Cache.

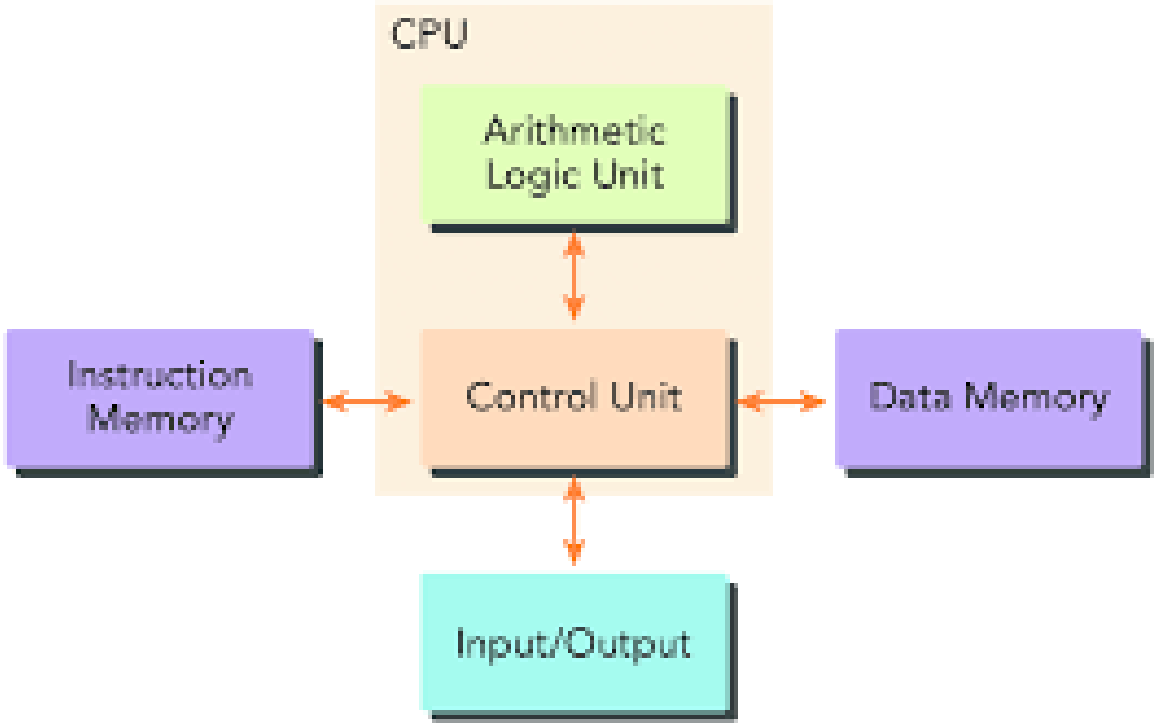
Microprocessor Architecture

- **Components:**
  - **Control Unit (CU):** Manages the execution of instructions.
  - **Arithmetic Logic Unit (ALU):** Performs arithmetic and logical operations.
  - **Registers:** Small, fast storage locations.
  - **Cache:** Stores frequently accessed data to speed up processes.
- **Types:** Von Neumann Architecture, Harvard Architecture.

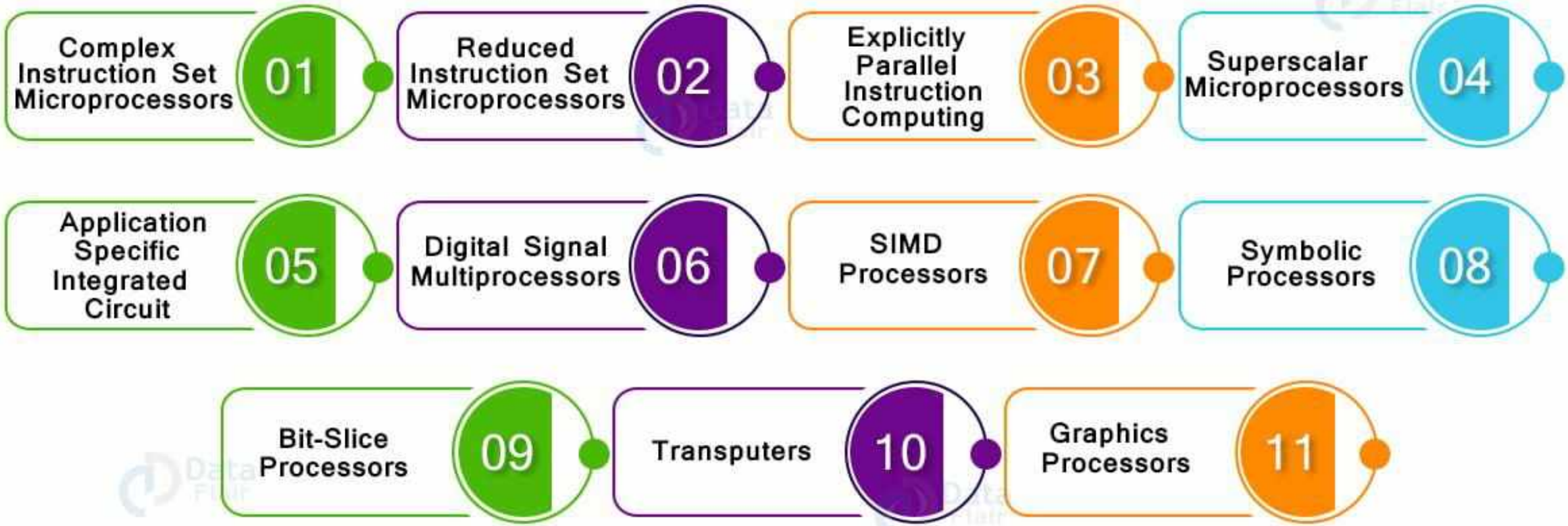

INTR
INTA
RST 5.5
RST 6.5
RST 7.5
TRAP
SID
SOD
Interrupt Control
Serial I/O Control
Accumulator (8)
Temporary Register (8)
Flag Flip-Flop (5)
Instruction Register (8)
Arithmetic Logic Unit (ALU) (8)
Instruction Decoder and Machine Cycle encoding
Register Select Logic
W (8) Temp. reg.
Z (8) Temp. reg.
B Reg. (8)
C Reg. (8)
D Reg. (8)
E Reg. (8)
H Reg. (8)
L Reg. (8)
Stack Pointer (16)
Program Counter (16)
Increment / Decrement latch (16)
VCC
GND
Power Supply
X1
X2
CLK O UT
Timing and control
RESET IN
RESET OUT
READY
ALE
S0
S1
IO/M
RD
WR
HOLD
HLDA
Address Buffer (8)
Address / Data Buffer(8)
A8 - A15
Address bus
AD0 – AD7
Address / DATA bus

VON NEUMANN ARCHITECTURE	HARVARD ARCHITECTURE
It is ancient computer architecture based on stored program computer concept.	It is modern computer architecture based on Harvard Mark I relay based model.
Same physical memory address is used for instructions and data.	Separate physical memory address is used for instructions and data.
There is common bus for data and instruction transfer.	Separate buses are used for transferring data and instruction.
Two clock cycles are required to execute single instruction.	An instruction is executed in a single cycle.
It is cheaper in cost.	It is costly than Von Neumann Architecture.
CPU can not access instructions and read/write at the same time.	CPU can access instructions and read/write at the same time.
It is used in personal computers and small computers.	It is used in micro controllers and signal processing.


Von Neumann Architecture Diagram
Central Processing Unit
Control Unit
Arithmetic Logic Unit
Registers
MAR
MDR
PC
Acc
Input
Output
Data
Memory
Program


CPU
Arithmetic Logic Unit
Instruction Memory
Control Unit
Data Memory
Input/Output

Types of Microprocessor



Applications of Microprocessors

- **Computing Devices:** PCs, laptops, tablets.
- **Embedded Systems:** Automotive control systems, home appliances, industrial machines.
- **Consumer Electronics:** Smartphones, smartwatches, gaming consoles.

Features of Microprocessor

Link for microprocessor architecture

- https://www.youtube.com/watch?v=I78iyzXQrP4