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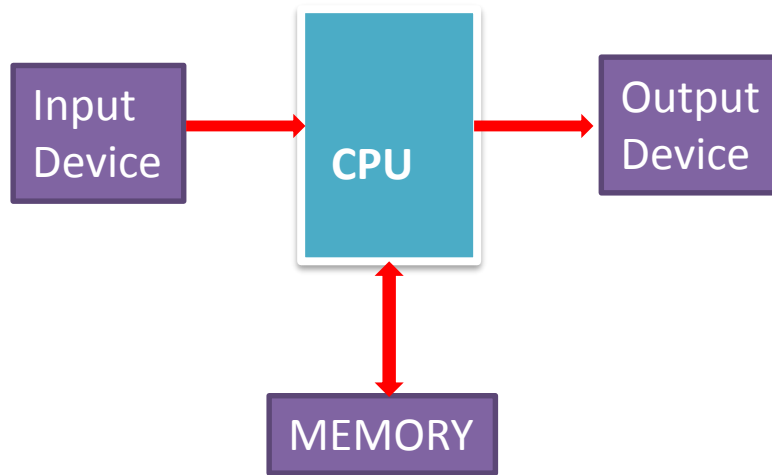
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# **Micro Processors & Interfacing**

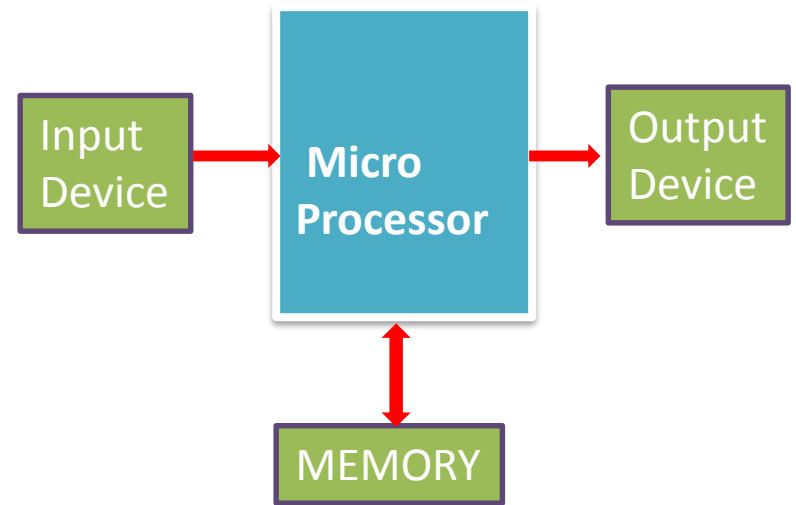
## **16CS307**

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# Micro Processor & Micro Controllers



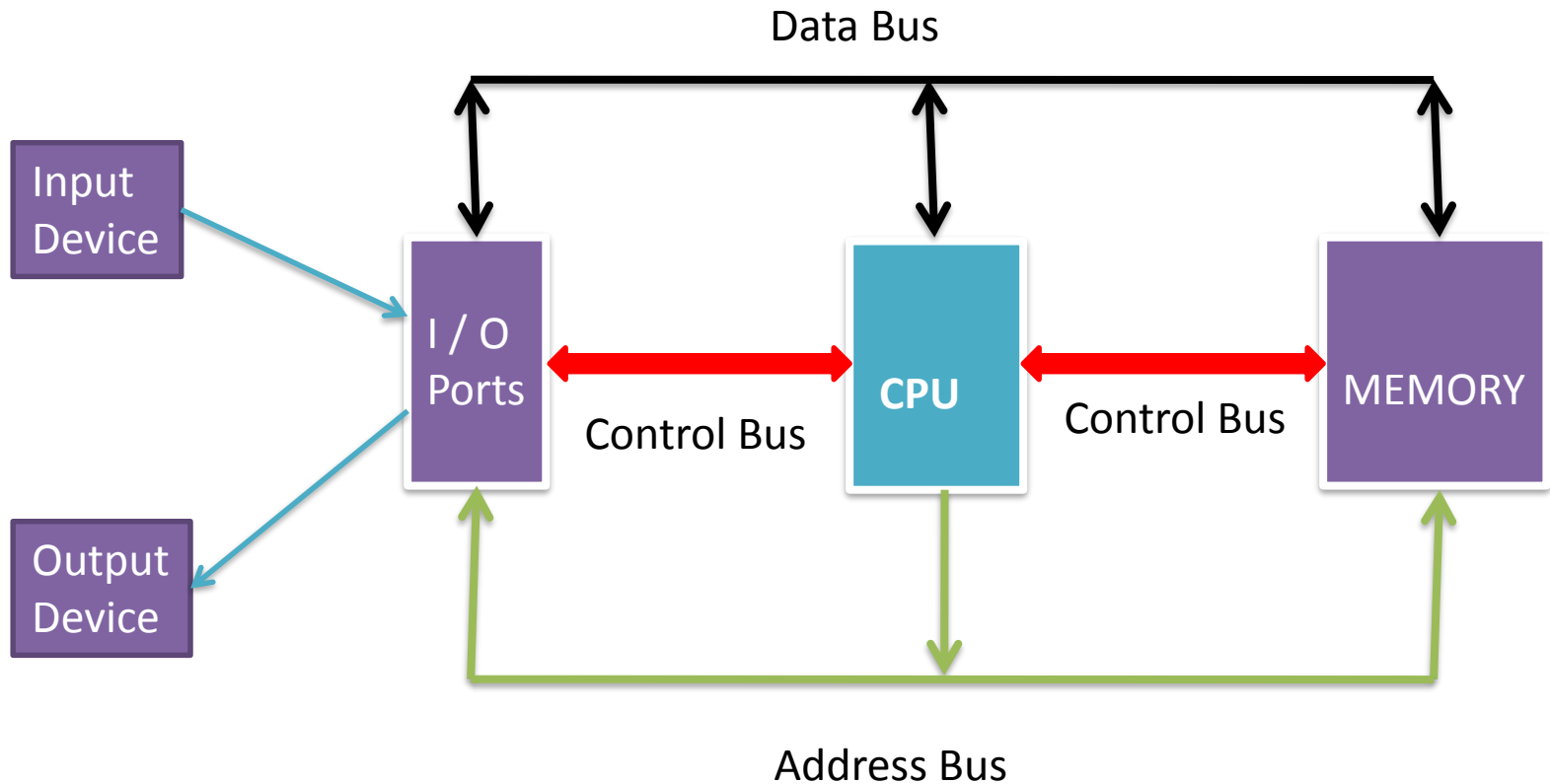
**Schematic Diagram of Digital Computer**



**Schematic Diagram of Micro Computer**

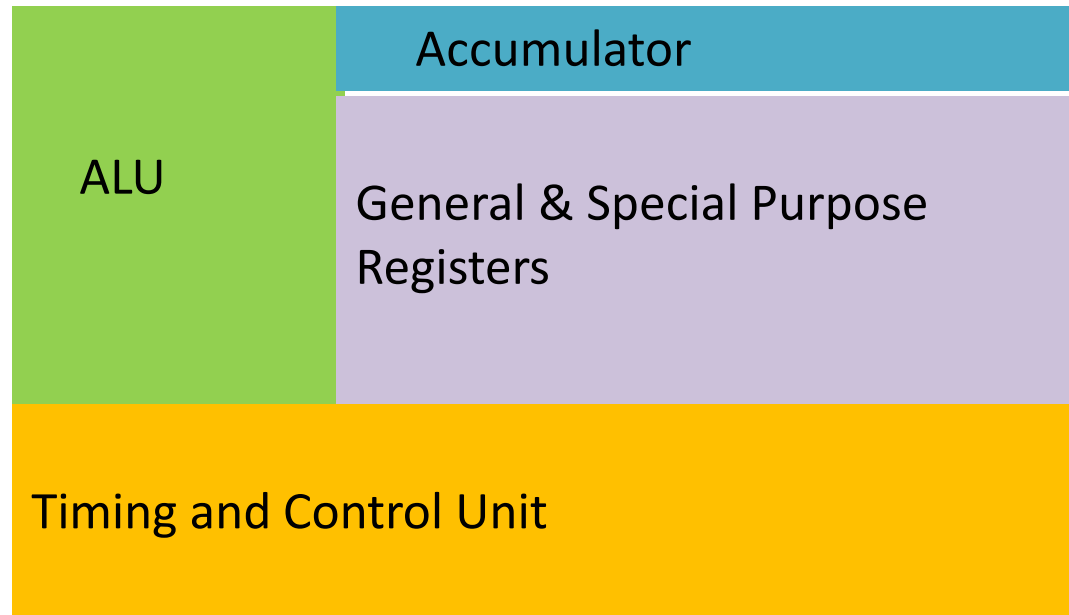
**Ref: B Ram**

# Block diagram of Micro Computer



Ref: Douglas V Hall

# Schematic Diagram / Internal parts of Micro Processor



**Ref: B Ram**

# Micro Processor & Micro Controllers

## Syllabus Overview

- UNIT 1 -** Introduction to 8086 Microprocessor
- UNIT 2 -** Hardware features of 8086
- UNIT 3 -** Advanced Processors
- UNIT 4 -** Introduction to 8051 Microcontroller
- UNIT 5 -** 8051 Microcontroller Hardware

# Micro Processor & Micro Controllers

## Syllabus Overview

### UNIT 1 -

### Introduction to 8086microprocessor

- **History** of Micro processors
- **Architecture** of 8086 → Register model
- **Memory Segmentation**
- **Software Aspects** of 8086 → Addressing modes
  - Instruction set
  - Interrupts → Hardware Interrupts  
Software Interrupts

### UNIT 2 -

### Hardware features of 8086 :

- Pins
- Max / Min modes
- Memory Interfacing

# Micro Processor & Micro Controllers

## Syllabus Overview

### UNIT 3 - ADVANCED PROCESSORS

- Real and Virtual Memory Addressing Modes
- Memory Management
- Memory Paging Mechanism
- Cache Memory Techniques
- Exception Handling
- Comparison of Microprocessors (8086 – 80186 – 80286 – 80386 – 80486)
- Comparison of Pentium Processors.

### UNIT 4 - Introduction to 8051Microcontroller

- Comparison of Micro processor and micro controller
- 8051 Architecture, Pin Diagram
- **Software Aspects** of 8051 → Addressing modes
  - Instruction set
  - Simple programs

# Micro Processor & Micro Controllers

## Syllabus Overview

### UNIT 5 -

### 8051 Microcontroller Hardware :

- Parallel Ports in 8051, 8051 Serial ports
- External Memory interfacing with 8051,
- 8051 Timers,
- 8051 Interrupts.
- LCD & Keyboard Interfacing
- ADC & DAC Interfacing
- Stepper Motor Interfacing
- External Memory interfacing.



## **TEXTBOOKS :**

1. **Douglas V.Hall, “Microprocessors & Interfacing”, 2nd ed., TMH, 2003.**
2. Kenneth J. Ayala, “8051 Microcontrollers”, Cengage Learning, 2008.

## **REFERENCEBOOKS :**

1. **A K Ray and KM Bhurchandi, “Advanced Microprocessors & Peripherals”, 2nd ed., TMH, 2006.**
2. Raj Kamal, “Microcontroller architecture, programming, Interfacing and System Design”, Pearson Education, 2005
3. The 8051 Microcontroller and Embedded Systems using Assembly and C – Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2<sup>nd</sup> Edn, Pearson Education, 2008.
4. Barry B.Brey: Intel Microprocessor Architecture, Programming and Interfacing- 8086/8088, 80186, 80286, 80386 and 80486, PHI, 1995.

# UNIT - 1

## Introduction to 8086 **M**icro **P**rocessor

# Introduction to 8086 Micro Processor

## Unit-1 Topics:

- ☐ Evolution Of Microprocessors,
- ☐ 8086 Microprocessor, Architecture,
- ☐ Register Model,
- ☐ Memory Segmentation,
- ☐ Physical Address Generation,
- ☐ Addressing Modes,
- ☐ Instruction Set,
- ☐ Interrupts Of 8086,
- ☐ Interrupt Vector Table.

# Definition of microprocessor:

Microprocessors can be defined based on 3 things. They are

i. **Based on the application of the device.**

The CPU of any microcomputer is called microprocessor.

ii. **Based on the name of the device.**

A small device which is able to do data processing is called microprocessor.

iii. **Based on the construction and operation of the device.**

Microprocessor is a VLSI/ULSI chip.

It accepts binary data from either an i/p device **or** from the memory and it access the instruction from the memory and it perform the operation of the received data according to the instruction & produces the results those are sent to either an o/p device or memory.

# Evolution of Microprocessors

**History of microprocessors:** - Main parameter → **word length**

**Definitions of word length: -**

The no. of bits processed by the CPU at a time are called word length.

**(or)**

The no. of bits transmitted or received by the CPU at a time.

**(or)**

The no. of bits identified by the CPU at a time are called word length.

# History

## Third Generation

During 1978

HMOS technology  $\Rightarrow$  Faster speed, Higher packing density

16 bit processors  $\Rightarrow$  40/ 48/ 64 pins

Easier to program

Dynamically relatable programs

Processor has multiply/ divide arithmetic hardware

More powerful interrupt handling capabilities

Flexible I/O port addressing

**Intel 8086** (16 bit processor)

## First Generation

Between 1971 – 1973

PMOS technology, non compatible with TTL

4 bit processors  $\Rightarrow$  16 pins

8 and 16 bit processors  $\Rightarrow$  40 pins

Due to limitations of pins, signals are multiplexed

**Intel 4004,4040** (4 bit processors)

## Fifth Generation **Pentium**

64 bit processors

## Fourth Generation

During 1980s

Low power version of HMOS technology (HCMOS)

32 bit processors

Physical memory space  $2^{24}$  bytes = 16 MB

Virtual memory space  $2^{40}$  bytes = 1 TB

Floating point hardware

Supports increased number of addressing modes

**Intel 80386**

## Second Generation

During 1973

NMOS technology  $\Rightarrow$  Faster speed, Higher density, Compatible with TTL

4 / 8/ 16 bit processors  $\Rightarrow$  40 pins

Ability to address large memory spaces and I/O ports

Greater number of levels of subroutine nesting

Better interrupt handling capabilities

**Intel 8085** (8 bit processor)

# Features of 8086: -

1. It is a 16-bit Microprocessor. So that it has 16 bit ALU, 16 bit registers and internal data bus and 16 bit external data bus. i.e., It's ALU, internal registers works on 16-bit binary word. It makes faster processing.
2. It was implemented in the year 1978 by Intel corp. by using **HMOS** (hybrid metal oxide semi-conductor or high speed MOS or high density MOS) technology.
3. 8086 processor has **20 address lines** A19-A0, and **16 data lines** D15-D0.

8086 has 20 bit address lines to access memory. Hence it can access  $2^{20} = 1$  MB memory location.  
8086 has 16-bit address lines to access I/O devices, hence it can access  $2^{16} = 64$ K I/O location

3. 8086 processor has **20 address lines** A19-A0, and **16 data lines** D15-D0.  
The data lines are multiplexed with lower order 16 address lines, and then the multiplexed address and data lines are AD15-AD0.  
The remaining higher order 4 address lines A16-A19 are multiplexing with the status Lines S3-S6.
4. It has three versions based on the frequency of operation
  - a) 8086 : 5MHz
  - b) 8086-2: 8MHz
  - c) 8086-1: 10 MHz
5. 8086 processor is available in 40-pin DIP (Dual in line Package).

# Features of 8086: -

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6. 8086 processor supports 256 interrupts.
7. It supports full duplex asynchronous serial communication and half duplex Synchronous serial communication.
8. 8086 processor have 4 general purpose registers, 4 segment registers, 3 pointer registers, 2 index registers and 1 flag register. **(Total : 14 registers)**  
Size of all these registers is 16-bit.
9. 8086 processor supports **segmented** version of **memory** (  $2^{20} = 1\text{MB}$  size).  
Size of each segment is 64KB. ( $2^{20} = 2^4 2^{16} = 2^4 \cdot 64\text{KB} = 16 \cdot 64\text{KB}$  **logical** segments)
10. 8086 operates in two different modes.
  - (1) Minimum mode or Single-Processor mode and
  - (2) Maximum mode or Multi-Processor mode.