

SNS COLLEGE OF TECHNOLOGY An Autonomous Institution Coimbatore-35

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING 23ECT221 - MICROPROCESSORS AND MICROCONTROLLERS

II YEAR/ IV SEMESTER

UNIT I - 8085 AND 8086 MICROPROCESSOR

TOPIC – Introduction to Microprocessor and Microcontroller

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- The microprocessor is a type of computer processor in which both the data processing logic and control are included on a single integrated circuit or small numbers of integrated circuits; in contrast, a microcontroller is a small, low-cost microcomputer on a single VLSI integrated circuit (IC) chip.
- It controls portions of an electronic system microprocessor unit (MOU) and some peripherals.



through a



Introduction to Microprocessor and microcontroller







DIFFERENCE BETWEEN MICROPROCESSOR AND MICROCONTROLLER

MICROPROCESSOR	MICRO
A microprocessor is a general purpose device is called a CPU	A microc a single c
Microprocessor based system design is complex	Microco
It is flexible which means we can change the size	It is not f
Microprocessor do not have power saving features	Microco
Size of RAM / ROM can vary	Size of the
It does not contain internal memory	It contair
Cost is high	Cost low

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CONTROLLER

- controller is a dedicated chip is called chip
- ntroller based system design is simple
- flexible
- ntrollers have the power saving mode
- he RAM / ROM fixed
- n internal memory



Difference between Microprocessor and Microcontroller

Let us now learn the difference between a microprocessor and a microcontroller in an embedded system through the following table:

Microprocessor	Microco
Since memory and I/O are connected externally, the circuit becomes large in size.	Since me circuit is
It cannot be used in compact systems	lt can be
Cost is high	Cost is lo
It is not suitable for devices that run on stored power since total power consumption is high due to external components.	It can be total pow compone
RAM, ROM, I/O units, and other peripherals are not embedded on a single chip.	RAM, RO a single o
Do not have power saving mode.	Have a p
Used in personal computers.	Used in e
Less number of registers.	More nur
Uses an external bus.	Uses an

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ontroller

emory and I/O are present together, the internal small in size.

used in compact systems.

WC

used on devices that use stored power since ver consumption is low due to less external ents.

M, CPU and other peripherals are embedded on chip.

ower-saving mode.

embedded systems.

mber of registers.

internal controlling bus.



Difference Between Microprocessor and Microcontroller

Less number of registers.	More num
Uses an external bus.	Uses an ir
Based on the Von Neumann model	Based on
It is a central processing unit on a single silicon-based integrated chip.	It is a byp with a CP
Complex and expensive due to a large number of instructions to process.	Simple an instruction
Can run at a very high speed.	Can run u



- ber of registers.
- nternal controlling bus.
- the Harvard architecture
- roduct of the development of microprocessors
- U along with other peripherals.
- d inexpensive due to less number of ns to process.
- p to 200MHz or more.



Detailed Differences Between Microprocessor and Microcontroller

- Microprocessor only consists of Central Processing Unit, whereas Microcontroller has memory, a CPU and I/O. All these are integrated into one chip.
- ✤ A microprocessor uses external bus to interface to ROM, RAM, and other peripherals. Microcontroller, on the other hand, uses internal controlling bus.
- A microprocessor is used in personal computers whereas microcontroller is used in embedded system.
- Microprocessor is based on the Von Neumann model whereas Microcontroller is based on the Harvard architecture.
- A microprocessor is complicated in nature, with a large set of instructions to process. Microcontroller is not that expensive and less complex with fewer instructions to process.





What is a microprocessor?

Microprocessor is a type of computer processor in which both the data processing logic and control are included on a single integrated circuit or on small numbers of integrated circuits. These processors consist of logic, control and arithmetic circuits. Its integrated circuit is capable of interpreting and executing program instructions. These are multiple-purpose, clock-driven and register-based digital integrated circuits that accept input in binary data and process it as per the instruction stored in its memory.





Components of a Microprocessor

A microprocessor has the following components

1.I/O Units

2.Control units

3.Arithmetic Logic Unit (ALU)

4.<u>Cache</u>

5.Registers





Types of Microprocessors

Microprocessors are segregated according to their usage. There are three main types of microprocessors:

1. CISC Microprocessor

- 2. DSP (Digital Signal Processor)
- 3. RISC Microprocessor
- 4. Input/output Processor (IOP)
- 5. Bit-Slice Microprocessors (BSM)
- 6. Graphics Processors
- 7. Coprocessor

7/2025





Difference between 8085 and 8086 Microprocessors

Here is the comparison between 8085 and 8086 microprocessors in a tabular format:

Parameter	8085 Microprocessor	8086 Microprocessor
Definition	The 8085 is an accumulator based 8-bit microprocessor which can process 8-bit of data at a time.	The 8086 is a register based 16-bit microprocessor which can process 16-bit of data at a time.
Microprocessor type	The 8085 microprocessor is an 8-bit accumulator- based microprocessor.	The 8086 microprocessor is a 16-bit general-purpose register-based microprocessor.
Data bus size	The 8085 microprocessor has a data bus of 8-bit size.	The size of the data bus of the 8086 microprocessor is 16-bit.
Address bus size	The size of the address bus of the 8085 microprocessor is 16-bit.	The size of the address bus of the 8086 microprocessor is 20-bit.
Maximum Accessible Memory capacity	The maximum accessible memory capacity of the 8085 microprocessor is 2^16 bytes or 64 kB.	The 8086 microprocessor has a maximum accessible memory capacity of 2^20 bytes or 1 MB.
ALU (Arithmetic Logic Unit) size	The 8085 microprocessor has an 8-bit ALU.	The 8086 microprocessor has 16-bit ALU.





Clock frequency	The 8085 microprocessor has an on-chip oscillator of 3 MHz.
Number of transistors	The 8085 microprocessor consists of 6500 transistors in its structure.
Operations	The 8085 microprocessor can perform addition, subtraction, increase, decrease, compare, AND, OR, X-OR, shift and complement. However, it does not support multiplication and division.
Number of flags	The 8085 microprocessor has 5 flags, named carry, auxiliary carry, parity, zero and sign flag.
Memory segmentation	Does not support memory segmentation.
Modes of operation	Supports a single mode of operation.
Pipelining architecture	The pipelining architecture is not supported by the 8085 microprocessor.



The 8086 microprocessor is available in three versions with a clock speed (frequency) of 5 MHz, 8 MHz and 10 MHz.

The 8086 microprocessor consists of 29000 transistors.

The 8086 microprocessor is able to perform all the operations of the 8085 microprocessor, as well as multiplication and division.

The 8086 microprocessor has 9 flags: carry, auxiliary carry, parity, zero, sign, trap, interrupt, direction, and overflow flag.

It supports memory segmentation as it is segmented, meaning a 20-bit address bus accesses 1 MB of memory but uses just four 64 kB segments from it.

Supports two modes of operation: minimum mode and maximum mode.

The 8086 microprocessor supports pipelining architecture.



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Processor configuration	8085 is a single-processor configuration microprocessor.	8086 is a multiprocessor configuration microprocessor.
Instruction queue	8085 microprocessor does not have an instruction queue.	8086 microprocessor has an instruction queue of 6 bytes, which is stored in the FIFO (First In, First Out) register.
Cost	8085 microprocessor is cheaper.	8086 microprocessor is relatively more expensive than the 8085 microprocessor

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Applications of Microprocessor

Given below are the Applications of the Microprocessors

- **Computer:** The Microprocessors are the CPU's in computers.
- Embedded Systems: It is utilized as the main processing block in the Embedded systems such as Washing machines, microwaves and other equipment's.
- Industrial Automation: It can be used to control Industrial machinery and equipment's.
- **Automotive:** The Modern day Vehicles uses Microprocessors in there ECUs. •
- **Telecommunications:** The Microprocessors are utilized in the Telecommunications systems such • as routers, modems, and switches.





What is a microcontroller?

A microcontroller is a small, low-cost <u>microcomputer</u> on a single VLSI integrated circuit (IC) chip. It controls portions of an electronic system through a microprocessor unit (MOU) and some peripherals. Microcontroller contains processor cores with additional peripherals such as serial interface, time, programmable I/O, and memory on the same chip. It interacts with other components due to its functionality resulting from combining digital memory and a digital processor with additional hardware. A microcontroller is also an Embedded controller, a single-chip-computer, or a computer on a chip.





Components of a Microcontroller

Microcontrollers consist of the following mentioned components: 1.Central Processing Unit (CPU) 2. Program Memory (ROM) 3.Data Memory (RAM) 4. Timers and Counters 5.I/O Ports (I/O – Input/Output) **6.Serial Communication Interface** 7.Clock Circuit (Oscillator Circuit) 8.Interrupt Mechanism 9.CAN (Controlled Area Network) 10.SPI (Serial Peripheral Interface) 11.I2C (Inter-Integrated Circuit) 12.DAC (Digital to Analog Converter) 13.ADC (Analog to Digital Converter) 14.USB (Universal Serial Bus





Types of Microcontrollers

Let us learn about the different types of microcontrollers based on different parameters.

1. Microcontrollers According to the size

- ✤ 8-bit Microcontroller:
- ✤ 16-bit microcontroller: These have more precision and better performance than an 8-bit microcontroller
- ✤ 32-bit microcontroller

2. Microcontrollers According to Memory Device

- Embedded Memory Microcontroller
- External Memory Microcontroller





Similarities Between Microcontrollers and Microprocessors

Microprocessors and microcontrollers are different types of electronic devices that have a number of differences. However, both have a few similarities as well. The following points highlight the similarities between microcontrollers and microprocessors:

- 1.Both microprocessor and microcontroller are semiconductor components that are built on IC.
- 2. These are used in different modern electronic equipment to automate processes.
- 3. Microcontroller and microprocessor both have a CPU through which both components process instructions and perform calculations.

4.Both consist of ALU, CPU, registers, address bus, data bus and control bus. 5.Both microprocessors and microcontrollers are built with internal registers. However, the number of registers is higher in microcontrollers as compared to microprocessors.





THANK YOU

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