

MCU 101

1. Overview of Microcontroller Unit (MCU): -

A Microcontroller Unit (MCU) is a compact integrated circuit designed to perform specific tasks in embedded systems.

It contains a processor (CPU), memory, and peripherals on a single chip, making it ideal for controlling devices such as appliances, vehicles, and robots.

2. MCU Architecture: -

MCUs typically have Harvard or Von Neumann architecture.

Key components include:

- CPU: Executes instructions.
- Memory: Divided into RAM (volatile) and ROM/Flash (non-volatile).
- Peripherals: Timers, ADC, communication modules (UART, SPI, I2C).
- I/O Ports: Interface with external devices.

3. MCU Clock System: -

The clock system provides timing signals to synchronize operations.

It can use internal RC oscillators or external crystal oscillators for accuracy.

Clock speed affects performance and power consumption.

4. MCU Memory Mapping: -

Memory mapping defines how memory and peripherals are addressed.

It includes program memory, data memory, and special function registers.

Proper understanding is crucial for firmware development.

5. MCU Bus Interfaces: -

Buses transfer data between CPU, memory, and peripherals.

Types include data bus, address bus, and control bus.

6. Advanced Microcontroller Bus Architecture (AMBA): -

AMBA is a set of standards for on-chip communication, widely used in ARM-based MCUs.

It includes:

- AHB (Advanced High-performance Bus)
- APB (Advanced Peripheral Bus)
- AXI (Advanced eXtensible Interface)

7. Reading MCU Datasheets and Specifications: -

A datasheet contains all technical details of an MCU: pin configuration, electrical characteristics, memory size, peripheral details, and timing diagrams.

Understanding the data sheet is essential for correct hardware and firmware design.