Introduction:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. It utilizes a microcontroller at its core, enabling users to create interactive projects that can sense and control the physical world.

Central Processing Unit (CPU):

The heart of an Arduino is the microcontroller, typically an Atmel AVR series chip. This 8-bit microcontroller operates using the Harvard architecture, separating program instructions (stored in flash memory) from data (stored in SRAM). The CPU executes instructions sequentially with a single-level pipeline and relies on a 16MHz crystal oscillator for clocking.

Memory:

- **Flash Memory:** This non-volatile memory stores the Arduino program code. Its capacity varies depending on the specific microcontroller used.
- **SRAM (Static Random-Access Memory):** This volatile memory holds temporary data used during program execution. Its capacity is also dependent on the microcontroller.

Input/Output (I/O) Pins:

Arduino boards provide various I/O pins for connecting sensors, actuators, and other electronic components. These pins can be categorized as:

- **Digital I/O Pins:** These general-purpose pins can be configured as inputs or outputs, allowing for reading digital signals (high/low) or controlling digital devices.
- **Analog Input Pins:** These pins can read analog voltage levels from sensors like temperature sensors or potentiometers.
- **PWM (Pulse Width Modulation) Pins:** These specialized digital pins can generate variable-width digital signals, useful for controlling motors or dimming LEDs.

Other Components:

- **USB Interface:** This port enables communication between the Arduino board and a computer for uploading code and serial communication.
- **Power Supply:** Arduino boards can be powered via the USB connector, an external power adapter, or battery.
- **Crystal Oscillator:** This component provides a stable clock signal for the CPU operation.
- **Voltage Regulator:** Regulates the input voltage to a stable level suitable for the microcontroller.
- **Reset Button:** Resets the microcontroller, restarting the program execution.
- **ICSP (In-Circuit Serial Programming) Header:** This header allows for directly programming the microcontroller without removing it from the board.