ADDITIONS IN ARDUINO

1. What Are Additions in Arduino?

Additions refer to any external components or modules that enhance the Arduino's ability to interact with the environment or perform specific tasks.

They include:

- Sensors
- Actuators
- Displays
- Communication modules
- Shields
- Libraries
- Expansion boards

2. Common Additions in Arduino Projects

A. Sensors (Input Devices)

Used to sense physical parameters:

Sensor Type	Example	Used For
Temperature	DHT11, LM35	Monitoring heat/temp
Light	LDR (Light Sensor)	Auto light systems
Distance	Ultrasonic (HC-SR04)	Proximity detection
Gas	MQ2, MQ135	Smoke/gas leakage detection
Motion	PIR Sensor	Intruder detection

B. Actuators (Output Devices)

Used to perform actions based on Arduino outputs:

Device	Use Case
Servo Motors	Robotics, precise movement
DC Motors	Cars, fans
Buzzers	Alarms, notifications
Relays	Switching high-voltage devices

C. Displays

To display data from Arduino:

Display Type	Description
LCD 16x2	Alphanumeric display
OLED Display	Graphical output, 0.96" screens
7-Segment	Displaying numbers

D. Communication Modules

For wireless or wired communication:

Module	Function
Bluetooth (HC-05/06)	Wireless control via phone
WiFi (ESP8266, NodeMCU)	IoT, online data transfer
RF Module (433 MHz)	Long-range wireless comm
GSM Module (SIM800L)	Send SMS, make calls
I2C/SPI	Interfacing multiple devices

E. Shields

Pre-made boards that stack on top of Arduino for plug-and-play functionality:

Shield Type	Purpose
Motor Driver Shield	Controlling multiple motors
Ethernet Shield	Internet connectivity
Sensor Shield	Easy sensor connections
LCD Keypad Shield	Display + input buttons

F. Expansion Boards

Other microcontroller-based boards to extend Arduino:

- NodeMCU (WiFi)
- ESP32 (WiFi + Bluetooth)
- Arduino Mega (more I/O pins)

G. Libraries (Software Additions)

- Help interact with sensors, displays, and modules

- Examples: DHT.h, Servo.h, Wire.h, LiquidCrystal.h

Real-World Example: Adding DHT11 Sensor and Display

Components Added:

- DHT11 Sensor
- 16x2 LCD Display

Function: Read temperature & humidity, display on LCD.

```
#include <DHT.h>
#include <LiquidCrystal.h>

#define DHTPIN 2
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);

LiquidCrystal lcd(7, 8, 9, 10, 11, 12);

void setup() {
```

```
  lcd.begin(16, 2);
  dht.begin();
}

void loop() {
  float h = dht.readHumidity();
  float t = dht.readTemperature();

  lcd.setCursor(0, 0);
  lcd.print("Temp: ");
  lcd.print(t);
  lcd.print(" C");

  lcd.setCursor(0, 1);
  lcd.print("Humidity: ");
  lcd.print(h);
  lcd.print("%");
```

```
  delay(2000);
}
```

Summary Table: Additions in Arduino

Type	Examples	Use
Sensors	DHT11, LDR, Ultrasonic	Data input
Actuators	Servo, Relay, Buzzer	Action output
Displays	LCD, OLED, 7-Segment	Display data
Communication	HC-05, ESP8266, GSM	Send/receive data
Shields	Motor, LCD, Ethernet	Plug-and-play functions
Libraries	Servo.h, DHT.h, LiquidCrystal.h	Code support
Boards	NodeMCU, Arduino Mega	More power/features