



## **ARDUINO PROGRAMMING COURSE SYLLABUS:**

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board. Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

### **Description**

This course is intended for enthusiastic students or hobbyists. With Arduino, one can get to know the basics of micro-controllers and sensors very quickly and can start building prototype with very little investment. This course is intended to make you comfortable in getting started with Arduino.

### **Prerequisites**

We assume that you are already familiar with the basics of C and C++. Knowledge in other programming language especially the OOP is an added advantage. A basic understanding of microcontrollers and electronics is also expected.

### **Learning Outcome**

The students will:

- ✓ Learn the basics of electronics, including reading schematics (electronics diagrams)
- ✓ Learn how to prototype circuits with a breadboard
- ✓ Learn the Arduino programming language and IDE
- ✓ Program basic Arduino examples
- ✓ Prototype circuits and connect them to the Arduino

- ✓ Program the Arduino microcontroller to make the circuits work
- ✓ Connect the Arduino microcontroller to a serial terminal to understand communication and stand-alone use
- ✓ Explore the provided example code and online resources for extending knowledge about the capabilities of the Arduino microcontroller

## **Outline of instructions**

### **I. Introduction**

- Introduction to embedded system
- Understanding Embedded System
- Overview of basic electronics and digital electronics.
- Microcontroller vs. Microprocessor
- Common features of Microcontroller.
- Comparison between the two
- Different types of microcontrollers.

### **II. Getting Started with Arduino**

- Introduction to Arduino
- Pin configuration and architecture.
- Device and platform features.
- Concept of digital and analog ports.
- Familiarizing with Arduino Interfacing Board
- Introduction to Embedded C and Arduino platform

### **III. Review of Basic Concepts**

- Arduino data types
- Variables and constants
- Operators
- Control Statements
- Arrays
- Functions

### **IV. Arduino i/o Functions**

- Pins Configured as INPUT
- Pull-up Resistors
- Pins Configured as OUTPUT
- pinMode() Function
- digitalWrite() Function
- analogRead() function
- Arduino Interrupts

### **V. Arduino Time**

- Incorporating Arduino time

- delay() function
- delayMicroseconds() function
- millis() function
- micros() function .

## **VI. Arduino Displays**

- Working with Serial Monitor
- Line graph via serial monitor
- Interfacing a 8 bit LCD to Arduino
- Fixed one line static message display.
- Running message display.
- Using the LCD Library of Arduino.

## **VII. Arduino Sensors**

- Arduino – Humidity Sensor
- Arduino – Temperature Sensor
- Arduino – Water Detector / Sensor
- Arduino – PIR Sensor
- Arduino – Ultrasonic Sensor
- Arduino – Connecting Switch (Magnetic relay switches)

## **VIII. Arduino Secondary Integrations**

- Types of Relay
- Controlling Electrical appliances with electromagnetic relays
- Working of a matrix keypad
- Using the keypad library to interface with Arduino.
- Interfacing Servo motors to Arduino
- Interfacing a RF Module

## **IX. Giving Input to the controller**

- Using serial input.
- Controlling LEDs with keys.
- Keys as toggle switch.
- Interfacing a piezo Buzzer
- Using a buzzer as an alarm unit

## **X. Arduino Communications**

- Parallel Communication
- Serial Communication Modules
- Types of Serial Communications
- Arduino UART
- GSM/GPRS Arduino Interfacing

## **XI. Making it a reality (Arduino Projects)**

This will involve designing, developing, coding and implement Arduino project. Projects will include but not limited to :

- ❖ Intelligent home locking system.
- ❖ Intelligent water level management system.
- ❖ Home automation using RFID.
- ❖ Real time clock-based home automation.
- ❖ Intelligent Automatic Irrigation System