# Embedded System Internship Program

## NeuronetiX

Ebram Maher
Embedded system instructor

# Introduction

Welcome to our embedded system Internship Program! This program is designed to equip you with hands-on experience in building embedded system project.

# Program Goals

- Equip interns with the necessary skills to build Embedded System.
- Know the roadmap of embedded systems.
- Provide opportunities for interns to apply their knowledge in a real-world project.
- Develop problem-solving and critical thinking skills.

# Project Selection

You will have the opportunity to choose your project based on your interests and skill level. We encourage you to discuss your preferences with your mentor during the initial program orientation.

# Projects

We've categorized the projects into 3 difficulty levels to cater to your skillsets and interests.

## Beginner Level:

**Basic Calculator:** calculator which can make a one operation between two digits.

**Components:** (AVR/ARM), DIO, LCD, Keypad.

**Potentiometer Voltage Value:** Implement a voltmeter system that display a voltage value on LCD in millivolt unit. Use a potentiometer to change the input voltage on the system. The system shall update the input voltage on the display every 1 second.

**Components:** (AVR/ARM), DIO, ADC, LCD, potentiometer.

**Arabic name:** Write your Arabic name on LCD.

**Components:** (AVR/ARM), DIO, LCD.

## Intermediate Level:

**Intermediate Calculator:** calculator which can make a one operation between two number.

**Components:** (AVR/ARM), DIO, LCD, Keypad.

**PWM drawer:** PWM drawer works as a mini oscilloscope that is responsible for printing the frequency and the waveform of the generated PWM signal. The generated wave came from two sources, external sources (e.g. generated PWM from other MCs), or internal source of the Microcontroller of the project itself.

• Specification – Graphical LCD:

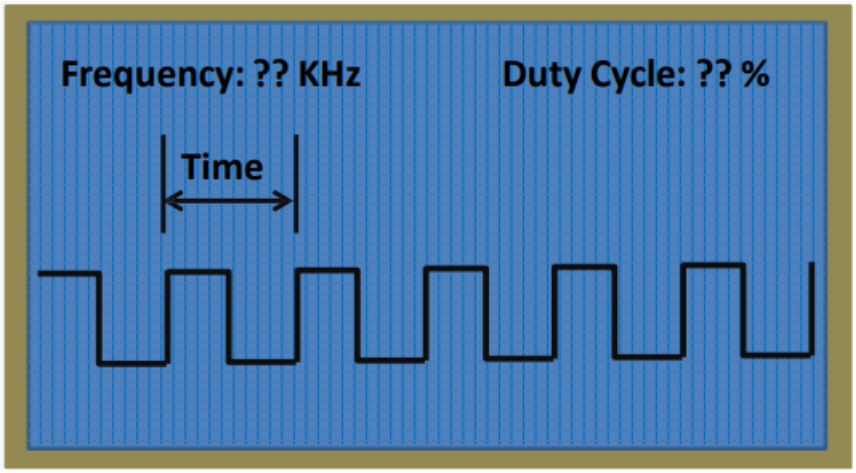
❑ With the graphical LCD we can display the following:

• The shape of the generated PWM from internally or externally sources.

• The frequency in KHz of the generated wave on the upper left side of the LCD.

• The duty cycle of the generated wave on the upper right side of the LCD.

• The time of the single cycle.




**Components:** (AVR/ARM), DIO, PWM, ICU, Graphical LCD.

**Blogging Platform:** Develop a platform for users to create and publish blog posts. Explore user-generated content management and commenting functionalities.

## Advanced Level:

**PWM drawer using OS (RTOS):** the same as PWM drawer in the Intermediate level but you will use OS(RTOS).

**Smart home:** • it is a popular project nowadays, it is a very comfortable application for humans, it aims to convert anything around to be controllable and smart. • At the following we have some requirement to implement smart home application: ❑ Remoted controlled by mobile or lab top. ❑ For emergency cases or controlling without mobile or lap-top use LCD and Keypad “user mode only”. ❑ The controllable things are 6 lamps “5 on/off lamps, one dimming lamp”, door, air-condition according to the ambient temperature.

❑ Login system admin and user “admin is remoted only”. ❑ Admin mode can register any user or remove. ❑ Usernames and password must be kept into memory even if the system is powered off. ❑ If admin or any user or passwords are entered wrong more than 3 trial, the system must break down and fire alarm until reset. ❑ Admin and user can access to all applies except user cannot control the door opening.

Specifications –LCD& keypad:

1. They are used to login to system as a user only.
2. After login, user can control all features except opening door.
3. They can control the system even if any user login by remoted mode except admin until allowing of admin.
4. The interfacing of LCD must display the running devices if the keypad-LCD system is not used. 5. The user’s usernames in this system different than the user’s usernames in the remoting system.

Specifications –EEPROM:

1. Storing the new user to the system “registration”.
2. It must be Read/write in admin mode.
3. It must be read only in user mode.

Specifications –TTL/Bluetooth:

1. Transmitting/Receiving between MC and PC/mobile.
2. Every action, Message must be printed on Mobile/PC screen, like:
   Hey, please Enter your username:
3. Transmitting/Receiving the commands to run the system.

Specifications –Lamps, Relay, Dimmer:

1. Lamps must be isolated because of high power.
2. Dimmer is a circuit that can control on the current flow to lamp depending on the input voltage “0 – 5V”.

Specifications –Temperature Sensor, DC motor:

1. Temperature sensor reads the ambient temperature, if the temperature is higher than 28 °C, Air condition must be run “DC motor”, if the temperature becomes lower than 21 °C, Air condition must be turned off “DC motor”.

Specifications – Door:

1. The actuator used is a servo motor to control the opening door only in admin mode, it is controlled by command which is send by Mobile/PC “Open\Close the door”

Component you may need:

1. (AVR/ARM) and 24C08 EEPROM, or use the internal.
2. Bluetooth module HC-05 or TTL (PL2003 or CH340or CP2102).
3. 5 transistors and relays (Not mandatory they can be replaced by LEDs.
4. 1 transistor and Solid-state Relay for dimming circuit.
5. LM35 temperature sensor or equivalent.
6. 2 NPN and DC motor
7. Keypad & Lm01602A Character LCD.

8. Servo motor.

Team Members:

Team members must not exceed Six members. It can be built by hardware or simulation.

**Advanced Calculator:** calculator which can make many operations on the real numbers.

# Additional Notes

- **Mentor Support:** Don't hesitate to reach out to me (your mentor) if you have any questions, encounter challenges, or need guidance throughout the project development process. I'm here to support your learning and ensure a successful internship experience.
- **Communication and Collaboration:** We encourage open communication throughout the program. Feel free to ask questions, share ideas, and collaborate with your fellow interns.