

# **INTERNSHIP ON EMBEDDED SYSTEMS**

Submitted in partial fulfilment of the requirements for the award of  
Bachelor of Engineering degree in

**ELECTRICAL AND ELECTRONICS ENGINEERING**

**BY**

**PRETIISH RAJASEKARAN(41140099)**



**DEPARTMENT OF ELECTRICAL AND ELECTRONICS  
ENGINEERING SCHOOL OF ENGINEERING**

**SATHYABAMA**

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC

JEPPIAAR N AGAR, RAJIV GANDHI

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119



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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**  
**BONAFIDE CERTIFICATE**

This is to certify that this Report is the bonafide work of **PRETIISH RAJASEKARAN (41140099)** who carried out the internship entitled **EMBEDDED SYSTEM WITH ARDUINO** under my supervision from 24-05-2023 to 28-05-2023

**Head of the Department**  
**(DR.S.RADHIKA)**

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Submitted for Viva voce Examination held on \_\_\_\_\_

**INTERNAL EXAMINER**

**(SIGNATURE)**

**EXTERNAL EXAMINER**

**(SIGNATURE)**

# DECLARATION

I **PRETIISH RAJASEKARAN** here by declare that the Report entitled **EMBEDDED SYSTEM** done by me **AT CODE BIND TECHNOLOGIES,CHENNAI** is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in ELECTRICAL AND ELECTRONICS ENGINEERING.

**DATE:24-05-23 to 28-05-23**

**PLACE: CHENNAI**

  
A handwritten signature in black ink, appearing to read 'Pretiish', is written over a horizontal line.

**PRETIISH RAJASEKARAN**

**SIGNATURE OF THE CANDIDATE**

# ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this Report and for completing it successfully. I am grateful to them.

I convey my thanks to **DR. N. M. NANDHITHA, Prof. & Dean, School of Electrical and Electronics Engineering** and **DR.S.RADHIKA ,Head of the Department, Dept. of ELECTRICAL AND ELECTRONICS ENGINEERING** for providing me necessary support and details at the right time during the progressive reviews.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of **Electrical and Electronics Engineering** who were helpful in many ways for the completion of the Report.

**PRETIISH RAJASEKARAN**

**Name of the candidate**

## **PREFACE**

Organizations are made up of people and function through people. Without people, organizations cannot exist. The resources of men, money, material, machinery, and mechanism are connected, coordinated and utilized through people. Engineers need to concentrate more on mechanism and the way in which things have been made. The need of training arises for doing things yourself, understanding its way.

Practical exposure for doing things makes a person conversant to the technicalities involved in any job. In view of such benefits, imparting of vocational training has been made an integral part of any academic structure.

In CODE BIND Technologies, training is given to Engineering Aspirants to secure future in the dynamic world of embedded system. Embedded system technology is one of the very fastest growing industries in the world. In this order I have taken 5 days at CODE BIND Technologies training. In my report I will try to give introduction to the embedded system and its technologies.

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## **ABSTRACT**

An embedded system is a combination of computer hardware and software designed for a specific function. Embedded systems may also function within a larger system. The systems can be programmable or have a fixed functionality. Industrial machines, consumer electronics, agricultural and processing industry devices, automobiles, medical equipment, cameras, digital watches, household appliances, airplanes, vending machines and toys, as well as mobile devices, are possible locations for an embedded system.

While embedded systems are computing systems, they can range from having no user interface (UI) -- for example, on devices designed to perform a single task -- to complex graphical user interfaces (GUIs), such as in mobile devices. User interfaces can include buttons, LEDs (light-emitting diodes) and touchscreen sensing. Some systems use remote user interfaces as well.

Markets and Markets, a business-to-business (B2B) research firm, predicted that the embedded market will be worth \$116.2 billion by 2025. Chip manufacturers for embedded systems include many well-known technology companies, such as Apple, IBM, Intel and Texas Instruments. The expected growth is partially due to the continued investment in artificial intelligence (AI), mobile computing and the need for chips designed for high-level processing.

# CHAPTER 1

## INTRODUCTION

An embedded system combines mechanical, electrical, and chemical components along with a computer, hidden inside, to perform a single dedicated purpose. There are more computers on this planet than there are people, and most of these computers are single-chip microcontrollers that are the brains of an embedded system. Embedded systems are a ubiquitous component of our everyday lives. We interact with hundreds of tiny computers every day that are embedded into our houses, our cars, our bridges, our toys, and our work. As our world has become more complex, so have the capabilities of the microcontrollers embedded into our devices. Therefore the world needs a trained workforce to develop and manage products based on embedded microcontrollers.

Modern embedded systems are often based on microcontrollers (i.e. microprocessors with integrated memory and peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in a certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase its reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

## CHAPTER 2

### INTRODUCTION TO MOTHERBOARDS

Here we consists of two different devices which serve as a Mother board for the entire project. Both devices have various features and applications. Here let us see what are the two devices and their usage and application.

#### 2.1 What is Microprocessor?

A **microprocessor** is a controlling unit of a micro-computer wrapped inside a small chip. It performs Arithmetic Logical Unit (ALU) operations and communicates with the other devices connected with it. It is a single Integrated Circuit in which several functions are combined.

#### Types of Microprocessor

Important types of Microprocessors are:

- Complex Instruction Set Microprocessors
- The Application Specific Integrated Circuit
- Reduced Instruction Set Microprocessors
- Digital Signal Multiprocessors (DSPs)

#### Features of Microprocessor

Here are some important features of Microprocessor:

- Offers built-in monitor/debugger program with interrupt capability
- Large amount of instructions each carrying out a different variation of the same operation
- Offers Parallel I/O
- Instruction cycle timer
- External memory interface

## **Applications of Microprocessor**

Microprocessors are mainly used in devices like:

- Calculators
- Accounting system
- Games machine
- Complex industrial controllers
- Traffic light
- Control data
- Military applications
- Defense systems
- Computation systems

## **2.2 What is Microcontroller?**

A **microcontroller** is a chip optimized to control electronic devices. It is stored in a single integrated circuit which is dedicated to performing a particular task and execute one specific application. It is specially designed circuits for embedded applications and is widely used in automatically controlled electronic devices. It contains memory, processor, and programmable I/O.

## **Types of Microcontroller**

Here are important types of Microcontroller:

- 8 bit Microcontroller
- 16 bit Microcontroller
- 32 bit Microcontroller
- Embedded Microcontroller
- External memory Microcontroller

## **Features of Microcontroller**

Here are some important features of Microcontroller:

- Processor reset
- Program and Variable Memory (RAM) I/O pins
- Device clocking central processor
- Instruction cycle timers

## Applications of Microcontroller

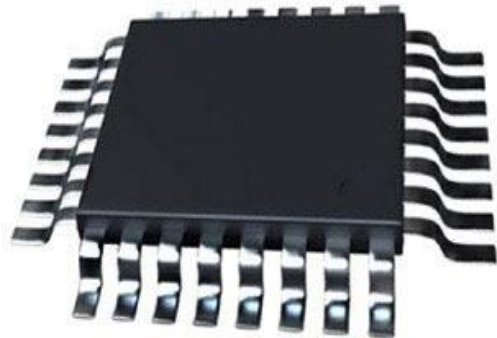
Microcontrollers are mainly used in devices like:

- Mobile phones
- Automobiles
- CD/DVD players
- Washing machines
- Cameras
- Security alarms
- Keyboard controllers
- Microwave oven
- Watches
- Mp3 players



**Microprocessor**

**V/S**



**Microcontroller**

## CHAPTER 3

### DESIGN PROCESS

The various steps in the embedded system design process are as follows:

- **Abstraction:** During this step, we abstract issues related to the system.
- **Software + hardware architecture:** In this stage, we obtain a complete understanding of the software and hardware before initializing the design process.
- **Extra functional properties:** During this stage, we assess the main design to gain a total understanding of the additional functions we need to implement.
- **System-related family of design:** When you design a system, it is necessary to refer to any previous system-related designs within the same family of designs.
- **Modular design:** One should make separate module designs so that you can utilize them later when needed.
- **Mapping:** Here is where we conduct software mapping; for example, we map program flow and data flow into one.
- **User interface design:** As its name implies, this correlates to the requirements of the user. Therefore, we are considering user requirements, the function of the system, and environmental analysis.
- **Refinement:** At this stage, we will refine each module and every component to ensure that the software team fully understands the requirements to meet.

- **Writing code:** You should have assembly language knowledge. Although you do not write code in assembly, it is necessary to comprehend it.
- **Configuring peripherals:** Since the majority of embedded systems utilize peripherals, you must understand how they work.
- **Testing code:** Here is where you systematically test functionality while simultaneously subjecting the device to environmental factors typical of its operating environment.
- **Refining code:** Here, we refine the code with possible adjustments and corrections to ensure the code is at a functional state.
- **Debugging code:** Here is where we look for additional errors within a functional code.
- **Verifying code:** At this stage, we confirm that the code performs correctly by providing code with continuous random inputs, thus ensuring the device functions properly and without malfunctioning.

Embedded systems design necessitates persistence in recognizing, determining, and meeting requirements. For example, there may be a device in which the need is longer battery life. In this case, the embedded system aims to meet this specific functional requirement. However, it is the responsibility of the embedded systems designer to recognize the vital characteristics and capabilities and then appropriately design the device.

## CHAPTER 4

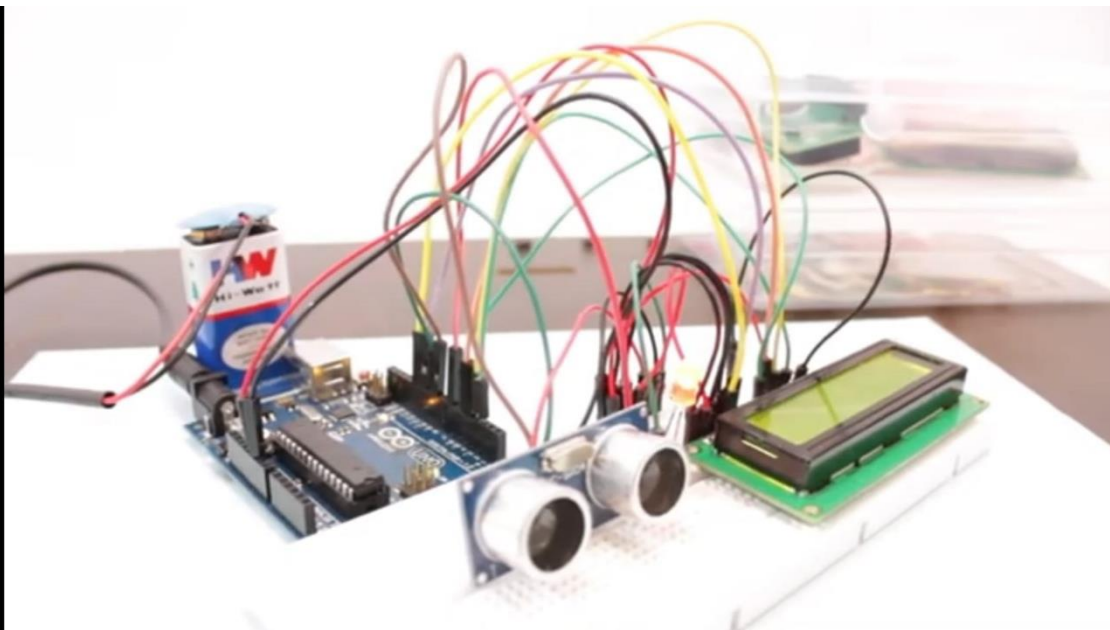
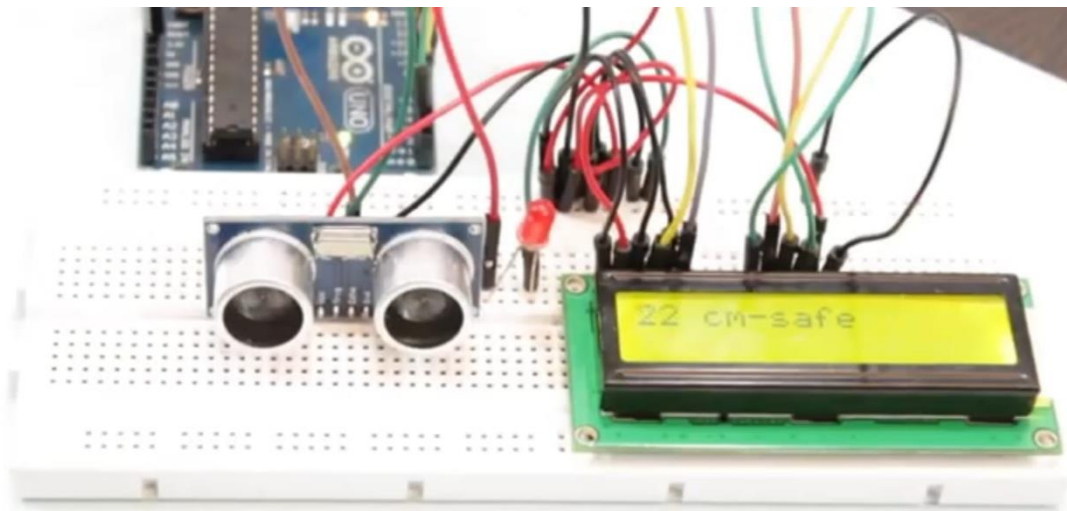
### MINI PROJECT

#### 4.1 Mini Project on Automatic obstacle detection system using Arduino IDE with ultrasonic sensor:

```
#include <HCSR04.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);
const int LEDBuzzerPin=1;
const int trigPin = 2;
const int echoPin = 3;

UltraSonicDistanceSensor distanceSensor(trigPin, echoPin);
void setup(){
  lcd.init();
  pinMode(LEDBuzzerPin,OUTPUT);
}

void loop(){
  lcd.backlight();
  lcd.clear();
  lcd.print("distance = ");
  lcd.setCursor(0,1);
  lcd.print(distanceSensor.measureDistanceCm()+1);
  lcd.print(" cm");
  if((distanceSensor.measureDistanceCm()+1)<3) {
    digitalWrite(LEDBuzzerPin,HIGH); // red LED lights up and buzzer starts ringing
  }else
  {
    digitalWrite(LEDBuzzerPin,LOW); // red LED goes out and buzzer stops
  }
  delay(500);
}
```



## CHAPTER 5

### CERTIFICATES

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CERTIFICATE OF INTERNSHIP

CERTIFICATE NUMBER    CBTINC242005230501

This certificate is awarded to **Mr/Ms. PRETIISH RAJASEKARAN**, for the successful completion of **Internship in Embedded Systems** at **CodeBind Technologies, Chennai** from **24<sup>th</sup> May 2023 to 28<sup>th</sup> May 2023**.

During the course of the internship **Mr/Ms. PRETIISH RAJASEKARAN**, exhibited an enthusiastic attitude for learning in addition to being quite industrious and dependable.

We are extremely satisfied with the candidate's performance and would like to wish them very success in their future endeavors.

  
Training Co-Ordinator



  
Issuing Authority



★★★★★

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## CERTIFICATE OF PROJECT COMPLETION

CERTIFICATE NUMBER    CBTINC242005230501

This certificate is awarded to **Mr/Ms. PRETIISH RAJASEKARAN**,  
on the successful completion of the project titled **"Automatic obstacle  
detection system using Arduino IDE using ultrasonic sensor"** at  
**CodeBind Technologies, Chennai**, from **24<sup>th</sup> May 2023** to **28<sup>th</sup> May  
2023**.

We found the candidate to be highly self-motivated, duty bound  
and hard working. The performance was above satisfactory and we  
wish them all the best in their future career.

  
Training Co-Ordinator



  
Issuing Authority



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## INPLANT TRAINING CERTIFICATE

CERTIFICATE NUMBER **CBTPE 242005230501**

This certificate is awarded to PRETISH RAJASEKARAN,  
who has undergone Inplant Training in EMBEDDED SYSTEMS,  
from 24.05.2023 to 28.05.2023 at CodeBind Technologies  
Chennai. During the course of training period, the conduct of the  
trainee was found to be Good.



*[Signature]*  
Training Facilitator



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Issuing Authority

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Branch Office: Coimbatore. Trichy.

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## WORKSHOP PARTICIPATION CERTIFICATE

CERTIFICATE NUMBER :  
**CBTWE242005230501**

*This certificate is awarded to PRETISH RAJASEKARAN, for his/her active  
and invaluable contribution to the One Day Workshop on ANDROID  
held on 29.05.2023 at CodeBind Technologies, Chennai. During the Workshop period  
the performance of the trainee was found to be Good.*

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CERTIFICATE NUMBER : BTAE 24200523 0501

### CERTIFICATE OF PARTICIPATION

This certificate is awarded to PRETHISH RAJASEKARAN, has successfully Completed a **"Corporate Training Test"** based on Placement Aptitude Questions held on 29.05.2023 at **CodeBind Technologies, Chennai**. On receiving this Certificate, the candidate will be allowed to access the Online Placement training portal to enhance their aptitude skills. The portal can be accessed by login in to the website [www.onlineplacementtraining.com](http://www.onlineplacementtraining.com).

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