

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

M.SAKTHIVEL(41140074)



**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 ELECTRONIC ENGINEERING
BONAFIDE CERTIFICATE

This is to certify that this report is the bonafide work of
M.SAKTHIVEI (41140074) who carried out the internship entitled
EMBEDDED SYSTEM WITH ARDUINO under my supervision from the
date of 24-05-2023 to 28-05-2023

HEAD OF THE DEPARTMENT

(DR.S.RADHIKA)

Submitted for Viva voce Examination held on _____

INTERNAL EXAMINER

EXTERNAL EXAMINER

(SIGNATURE)

(SIGNATURE)

DECLARATION

I M.SAKTHIVEL 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 'S. Sakthivel', with a long horizontal stroke extending to the left.

M.SAKTHIVEL

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.

M.SAKTHIVEL

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 it's 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

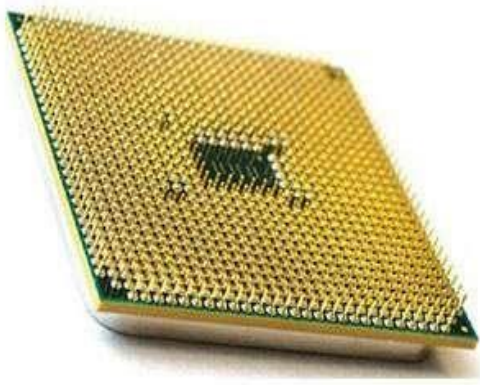
Here are some important features of Microcontroller:

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

Applications of Microcontroller

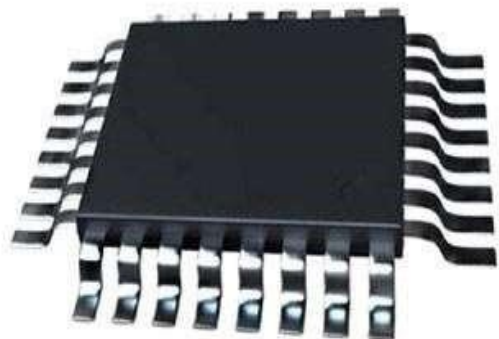
Microcontrollers are mainly used in devices like:

- 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

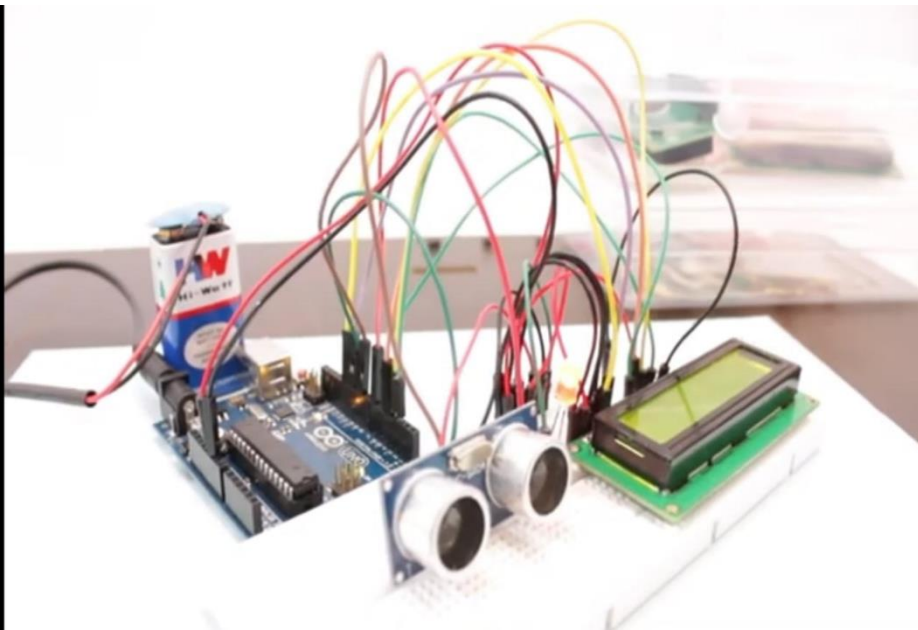
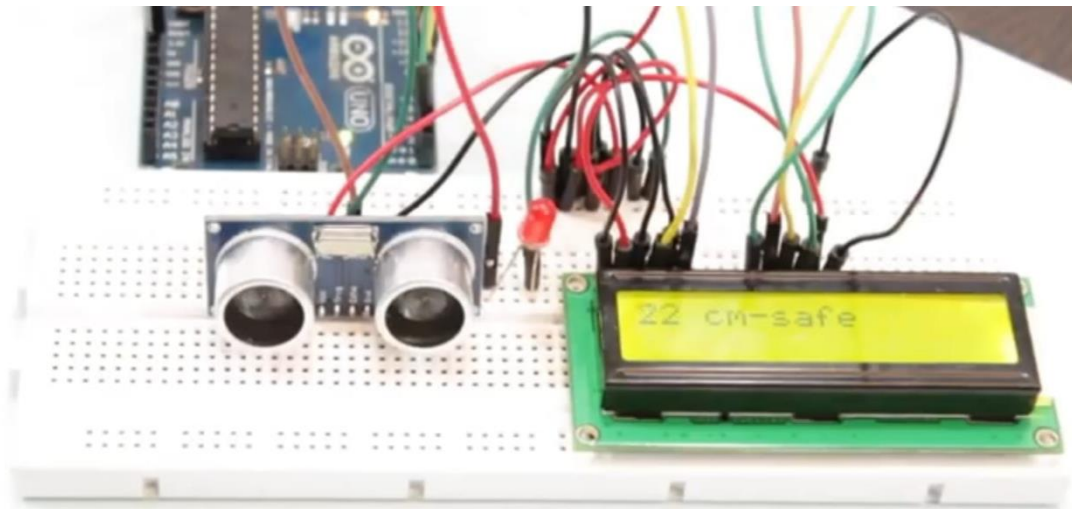
MINI PROJECT

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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WORKSHOP PARTICIPATION CERTIFICATE CERTIFICATE NUMBER : **CBTWE242005230502**

This certificate is awarded to SAKTHIVEL . M, 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 :

CBTAE242005230502

CERTIFICATE OF PARTICIPATION

This certificate is awarded to SAKTHIVEL. M, 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.

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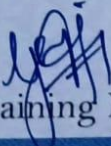
info@codebindtechnologies.com

INPLANT TRAINING CERTIFICATE

CERTIFICATE NUMBER **CBTPE242005230502**

This certificate is awarded to SAKTHIVEL . M,
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.




Training Facilitator




Issuing Authority

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CERTIFICATE OF INTERNSHIP

CERTIFICATE NUMBER CBTINC242005230502

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

During the course of the internship **Mr/Ms. SAKTHIVEL.M**, 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




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CERTIFICATE OF PROJECT COMPLETION

CERTIFICATE NUMBER CBTINC242005230502

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




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