

INTERNSHIP ON EMBEDDED SYSTEMS

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

ELECTRIC AND ELECTRONICS ENGINEERING

BY

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**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

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OCTOBER-2023



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

This is to certify that this Report is the bonafide work of **K.MANIBHARATHI (41140054)** who carried out the internship entitled EMBEDDED SYSTEMS WITH ARDUINO under my supervision from 24- 05- 2023 to 28-05-2023

Head of the Department

()

Submitted for Viva voce Examination held on _____

INTERNAL EXAMINER

(SIGNATURE)

EXTERNAL EXAMINER

(SIGNATURE)

DECLARATION

I **K.MANIBHARATHI** here by declare that the Report entitled **EMBEDDED SYSTEMS** 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 'Mani Bharathi', written over a horizontal line.

K.MANIBHARATHI

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.

K.MANIBHARATHI

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

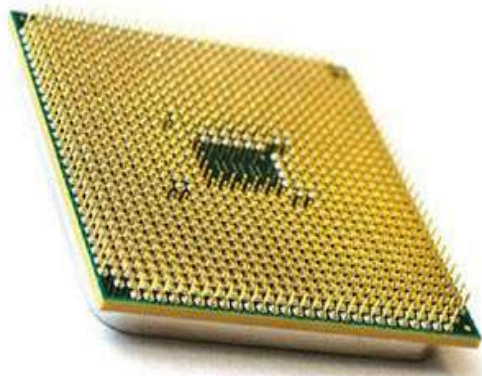
Here are some important features of Microcontroller:

- 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:

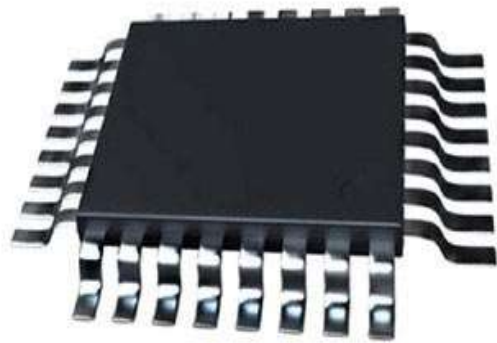
- Mobile phones
- Automobiles
- CD/DVD players
- Washing machines
- Cameras
- Security alarms
- Keyboard controllers
- Microwave oven
- Watches
- Mp3 players



Microprocessor

fig 2.1:microprocessor

V/S



Microcontroller

fig 2.2: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.

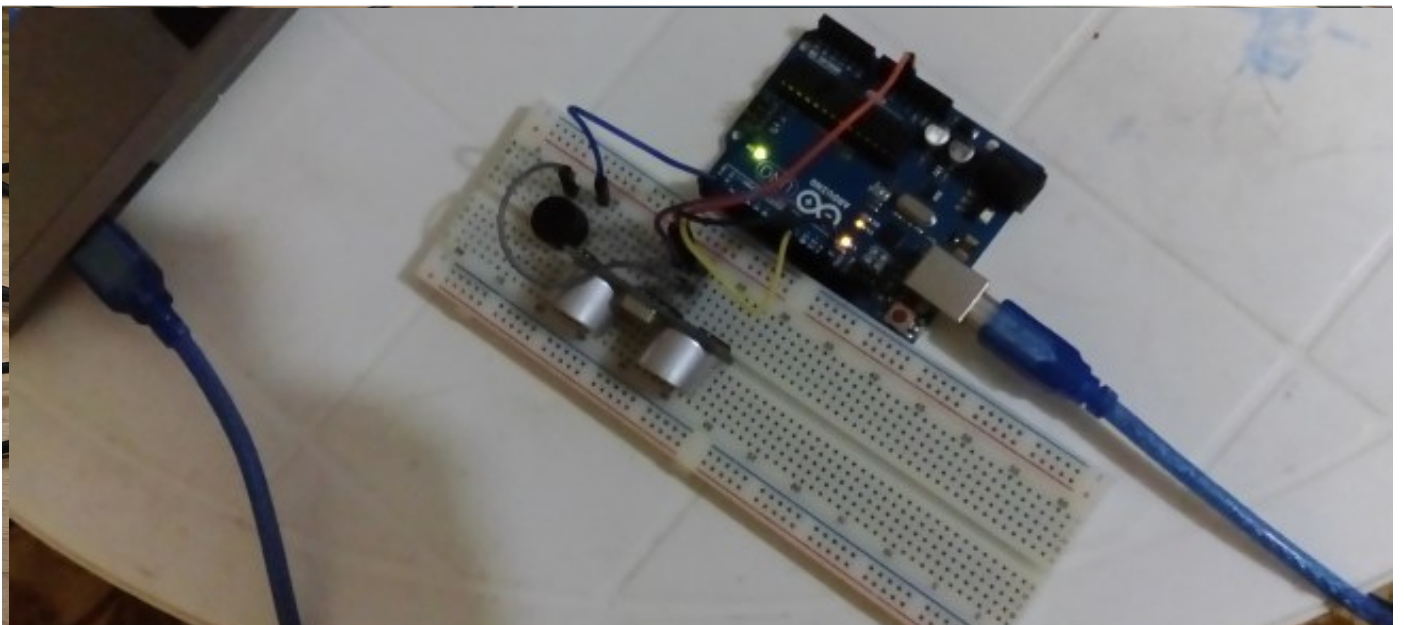
Embedded systems design necessitates persistence in recognizing, determining, and meeting requirements. For example, there may be a device in which the need is longer battery life. In this case, the embedded system aims to meet this specific functional requirement. However, it is the responsibility of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

CHAPTER 4

MINI PROJECT

4.1 Automatic obstacle detection system using Arduino IDE using ultrasonic sensor

```
1  int trig = 10;
2  int echo = 11;
3  int led1 = 13;
4  int led2 = 12;
5  int led3 = 9;
6  int led4 = 8;
7  int led5 = 7;
8  int led6 = 6;
9  int led7 = 5;
10 int led8 = 4;
11 int led9 = 3;
12 int led10 = 2;
13
14
15
16 void setup() {
17     // put your setup code here, to run once:
18     pinMode(13, OUTPUT);
19     pinMode(12, OUTPUT);
20     pinMode(11, INPUT);
21     pinMode(10, OUTPUT);
22     pinMode(9, OUTPUT);
23     pinMode(8, OUTPUT);
24     pinMode(7, OUTPUT);
25     pinMode(6, OUTPUT);
26     pinMode(5, OUTPUT);
27     pinMode(4, OUTPUT);
28     pinMode(3, OUTPUT);
29     pinMode(2, OUTPUT);
30 }
```



SUMMARY & CONCLUSION

5.1 CONCLUSION:

In retrospect, the embedded systems internship has been an incredibly enriching and transformative experience. Over the course of this workshop, I have delved into the intricate world of embedded systems, exploring their applications, design principles, and real-world implementations. This journey has not only deepened my technical expertise but has also sharpened my problem-solving skills and instilled in me a profound sense of curiosity for the endless possibilities within this field. One of the most significant takeaways from this internship has been the hands-on experience with various microcontrollers, sensors, and actuators. The practical sessions provided invaluable insights into the complexities of hardware-software integration, enabling me to bridge theoretical knowledge with real-world applications. Collaborating with my peers on challenging projects enhanced my teamwork and communication skills, teaching me the importance of collaboration in the development process. Additionally, the mentorship and guidance from industry experts have been instrumental in shaping my understanding of embedded systems. Their real-world anecdotes and practical tips have not only made the learning process engaging but have also offered valuable glimpses into the professional landscape of embedded systems development. I am deeply grateful for the opportunity to participate in this internship.

5.2 FEEDBACK

The internship training is very useful as well as it brought a good exposure to the information technologies and huge production and lots of employees and employers who are kindly guiding us towards the peaceful training sessions and we thank the guides and mentors who guided us during the training sessions.

REFERENCE

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CERTIFICATES

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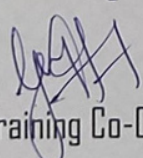
CERTIFICATE OF INTERNSHIP

CERTIFICATE NUMBER **CBTINC242005230503**

This certificate is awarded to **Mr/Ms. K.MANIBHARATHI**, 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. K.MANIBHARATHI**, 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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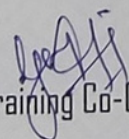


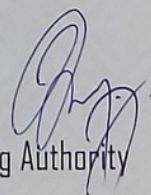
CERTIFICATE OF PROJECT COMPLETION

CERTIFICATE NUMBER CBTINC242005230503

This certificate is awarded to **Mr/Ms. K.MANIBHARATHI**, 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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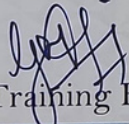


INPLANT TRAINING CERTIFICATE

CERTIFICATE NUMBER CBTPE 242005230503

This certificate is awarded to K. MANIBHARATHI,
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




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