

REPORT ON INTERNSHIP IN EMBEDDED SYSTEM WITH IOT

Submitted in partial fulfilment of the requirements for the completion of
PROFESSIONAL TRAINING

By

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with grade “A++” by NAAC

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OCTOBER 2023



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Internship Report submitted for EPICS is the bonafide work of **SASIKUMAR K** (41140079) who carried out the **EMBEDDED SYSTEM WITH IOT** Internship during the period May 2023 to June 2023.

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I am **SASIKUMAR K** (41140079) here by declared that the report entitled **EMBEDDED SYSTEM WITH IOT** done by me at **NSIC, GUINDY** is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in **ELECTRICAL AND ELECTRONIC ENGINEERING**.

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TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
1	INTRODUCTION ABOUT THE COMPANY	1
	1.1 OBJECTIVE AND MISSION	1
	1.2 SERVICE OFFERED	2
	1.1.1 FINANCIAL SUPPORT	2
	1.1.2 TECHNOLOGY SUPPORT	3
	1.1.3 MARKETING ASSISTANCE	3
	1.1.4 TRAINING AND SKILL DEVELOPMENT	4
	1.3 SCHEMES AND INITIATIVES	6
2	NATURE OF WORK DONE	7
3	METHODS AND PROCESSES	9
	3.1 IOT INTEGRATION IN EMBEDDED SYSTEMS	9
	3.2 SECURITY IN EMBEDDED IOT DEVICES	10
	3.3 IMPLEMENT IN REALTIME	11
4	KNOWLEDGE AND EXPERIENCE	12
	4.1 KNOWLEDGE GAINED	12
	4.1.1 UNDERSTANDING FUNDAMENTAL ELECTRONIC COMPONENTS	12
	4.1.2 PRACTICAL CIRCUIT SOLDERING SKILLS	13
	4.1.3 PROGRAMMING ARDUINO MICROCONTROLLERS	13

	4.1.4 WORKING WITH VARIOUS SENSORS	14
	4.1.5 EXPLORING THE 8085 MICROPROCESSOR	15
	4.1.6 FAMILIARIZATION WITH PROTEUS SOFTWARE	16
	4.1.7 PRACTICAL APPLICATION IN REAL-TIME PROJECT	17
	4.2 EXPERIENCE	17
	4.2.1 HANDS-ON LEARNING AND PRACTICAL APPLICATION	17
	4.2.2 COLLABORATIVE ENVIRONMENT AND TEAMWORK	17
	4.2.3 PROJECT MANAGEMENT AND TIME-EFFICIENT EXECUTION	18
5	SUMMARY AND CONCLUSION	18
	5.1 SUMMARY	18
	5.2 CONCLUSION	19
6	APPENDIX	21

LIST OF FIGURES

FIGURE No	TITLE	PAGE No.
1.1	NSIC Logo	2
1.2	NSIC Class Room	5
1.3	NSIC Electrical Room	6
3.1	IOT	9
3.2	Embedded System	10
3.3	Realtime Weather monitoring System	11
4.1	Basic Components in Electricals	12
4.2	Soldering	13
4.3	Arduino UNO	14
4.4	Sensors	15
4.5	Pin diagram of 8085 Microprocessor	16
4.6	Proteous	16
6.1	Internship Certificate	21

CHAPTER 1

INTRODUCTION ABOUT THE COMPANY

1.1 OBJECTIVE AND MISSION

Objectives:

Promote Small Industries: To promote and develop small-scale industries (SSIs) by providing support, guidance, and assistance to enhance their competitiveness and growth.

Facilitate Marketing Support: To assist SSIs in marketing their products both domestically and internationally, facilitating access to markets and enhancing market share.

Offer Financial Assistance: To provide financial assistance and credit support to SSIs through various schemes to meet their working capital and investment needs.

Foster Technology and Skill Development: To encourage and support SSIs in adopting modern technologies and enhancing their skills through training and capacity-building programs.

Enable Infrastructural Support: To provide support in setting up industrial infrastructure, including technology parks, testing facilities, and incubation centers to bolster industrial growth.

Mission:

NSIC's mission is to be the premier government organization driving the growth of small-scale industries and promoting their sustainability. By offering a comprehensive range of services and support, NSIC aims to empower SSIs, enhance their global competitiveness, and contribute to the economic development of the nation. The mission is focused on fostering

entrepreneurship, encouraging innovation, creating employment opportunities, and promoting inclusive growth through the development of MSMEs.



Figure 1.1 NSIC Logo

1.2 SERVICE OFFERED

1.2.1 FINANCIAL SUPPORT

The National Small Industries Corporation (NSIC) plays a crucial role in supporting the financial needs of Micro, Small, and Medium Enterprises (MSMEs) in India. Through a range of financial assistance programs, NSIC aims to bolster the growth and development of these enterprises. One significant aspect of this support is the provision of assistance for procuring raw materials, ensuring that MSMEs have the necessary inventory for production. Moreover, NSIC extends aid to MSMEs in marketing their products and services, assisting them in trade fairs, exhibitions, and other promotional efforts. Working capital, essential for daily operations, is another focus area, with NSIC facilitating loans from banks and financial institutions to meet these requirements. Furthermore, financial support is provided to MSMEs for technology upgrades, allowing them to enhance productivity and efficiency. NSIC also offers assistance in bill discounting, enabling MSMEs to manage cash flow effectively. Schemes like

Technology Upgradation Fund Scheme (TUFS) and Performance and Credit Rating Scheme further contribute to financial empowerment by encouraging technology modernization and facilitating better credit terms. By providing these financial avenues, NSIC empowers MSMEs to thrive, contribute to the economy, and fulfill their potential for growth and innovation.

1.2.2 TECHNOLOGY SUPPORT

The National Small Industries Corporation (NSIC) offers substantial technology support to Micro, Small, and Medium Enterprises (MSMEs) in India. This support is vital for enhancing the technological capabilities and competitiveness of these enterprises. NSIC assists MSMEs in adopting modern technologies by providing guidance, expertise, and knowledge transfer. The organization facilitates workshops, seminars, and training programs that focus on the latest advancements and best practices in various industries. Additionally, NSIC collaborates with research and development institutions to promote technology upgradation and innovation within the MSME sector. This collaboration allows MSMEs to access cutting-edge research and emerging technologies, fostering a culture of innovation and continuous improvement. By enabling MSMEs to embrace advanced technologies, NSIC aims to elevate their efficiency, product quality, and overall operational effectiveness, thereby contributing to the growth and development of the MSME sector and the nation's economy.

1.2.3 TRAINING AND SKILL DEVELOPMENT

Training and skill development are integral components of fostering growth, sustainability, and competitiveness within the Micro, Small, and Medium Enterprises (MSMEs) sector. This sector is a cornerstone of any economy, providing employment to a significant portion of the population and acting as a catalyst for economic development. Effective training and skill development

programs are paramount to enhancing productivity, encouraging entrepreneurship, and improving the overall competitiveness of MSMEs.

Firstly, training enhances productivity by equipping employees with the necessary skills and knowledge to perform their tasks more effectively, leading to increased output and operational efficiency. Furthermore, as technology continues to evolve at a rapid pace, training programs become essential to help MSMEs adapt and integrate these technological changes into their operations seamlessly. Technological upskilling ensures that the workforce remains relevant and competent in an ever-changing landscape.

Moreover, skill development contributes to the improvement of product and service quality, resulting in higher customer satisfaction and retention. A skilled workforce is more likely to innovate and think critically, fostering creativity and problem-solving capabilities. This culture of innovation is crucial for the development of new products, processes, and business models, driving growth and sustainability within the MSME sector.

The National Small Industries Corporation (NSIC) plays a significant role in supporting training and skill development initiatives. NSIC organizes various skill development programs, workshops, and training sessions to enhance the technical and managerial skills of MSME entrepreneurs and their workforce. Collaborations with educational and research institutions ensure access to industry-relevant training, promoting a culture of continuous learning and development. Additionally, Entrepreneurship Development Programs (EDPs) by NSIC nurture entrepreneurial talent by providing guidance and training in areas such as business planning, financial management, marketing, and more.

1.2.4 MARKETING ASSISTANT

A Marketing Assistant plays a vital role in supporting the marketing team and executing marketing strategies within an organization. Their responsibilities

encompass a wide array of tasks crucial to promoting products, services, and enhancing the brand's visibility. One of their primary roles involves conducting market research to understand consumer preferences, industry trends, and competitor strategies. This information aids in making informed marketing decisions and devising effective strategies. Additionally, Marketing Assistants contribute to content creation by developing engaging materials such as social media posts, blog articles, newsletters, and promotional content. They manage the organization's social media platforms, interacting with the audience, scheduling posts, and analyzing performance to optimize marketing strategies. Moreover, Marketing Assistants assist in coordinating marketing events, managing customer inquiries, supporting email marketing campaigns, and participating in various marketing initiatives. Overall, they serve as a valuable asset to the marketing team, contributing to the successful implementation of marketing efforts and achieving organizational goals.



Figure 1.2 NSIC Class Room

1.3 SCHEMES AND INITIATIVE

A Marketing Assistant plays a vital role in supporting the marketing team and executing marketing strategies within an organization. Their responsibilities encompass a wide array of tasks crucial to promoting products, services, and enhancing the brand's visibility. One of their primary roles involves conducting market research to understand consumer preferences, industry trends, and competitor strategies. This information aids in making informed marketing decisions and devising effective strategies. Additionally, Marketing Assistants contribute to content creation by developing engaging materials such as social media posts, blog articles, newsletters, and promotional content. They manage the organization's social media platforms, interacting with the audience, scheduling posts, and analyzing performance to optimize marketing strategies. Moreover, Marketing Assistants assist in coordinating marketing events, managing customer inquiries, supporting email marketing campaigns, and participating in various marketing initiatives. Overall, they serve as a valuable asset to the marketing team, contributing to the successful implementation of marketing efforts and achieving organizational goals.



Figure 1.3 NSIC Electrical Room

CHAPTER 2

NATURE OF WORK DONE

Working at the National Small Industries Corporation (NSIC) provides a dynamic and multifaceted role dedicated to empowering and supporting Micro, Small, and Medium Enterprises (MSMEs). At the heart of the work lies a commitment to nurturing the growth and development of MSMEs, vital players in the Indian economy. This commitment manifests through a diverse array of responsibilities and initiatives.

One significant aspect of the role involves actively participating in the implementation of crucial schemes and programs aimed at uplifting MSMEs. These schemes include the Single Point Registration (SPR) Scheme, which simplifies the tendering process for MSMEs by exempting them from Earnest Money Deposit (EMD) payments and enabling them to participate in government tenders with ease. Similarly, the Technology Upgradation Fund Scheme (TUFS) offers financial assistance to MSMEs for upgrading their technology and machinery, ensuring that they remain competitive and aligned with contemporary industrial advancements.

Financial support is a linchpin in the spectrum of services provided. Assisting MSMEs in obtaining working capital loans and availing credit support from financial institutions, NSIC plays a pivotal role in enabling these enterprises to meet their operational needs and invest in their growth. Additionally, initiatives like the Raw Material Assistance Scheme ensure that MSMEs can procure raw materials at concessional rates, alleviating financial burden and promoting increased production capacities.

To bolster the marketing capabilities of MSMEs, NSIC undertakes initiatives such as organizing trade fairs, exhibitions, and buyer-seller meets. These events serve as platforms for MSMEs to showcase their products and services to a wider audience, fostering networking and business opportunities. Furthermore, the Performance and Credit Rating Scheme aids in enhancing the credibility of

MSMEs by assisting them in obtaining credit ratings, which, in turn, facilitates access to finance on favorable terms.

A critical element of the work involves conducting comprehensive market research. This research provides valuable insights into market trends, consumer preferences, and the competitive landscape, empowering MSMEs to make informed business decisions. This intelligence is instrumental in guiding marketing strategies and tailoring products and services to meet the evolving demands of the market.

Collaboration is another key aspect. Encouraging MSMEs to form consortia, NSIC promotes collective bidding for tenders, boosting the chances of success and fostering a collaborative spirit among MSMEs. Additionally, the organization facilitates collaboration with research and academic institutions to drive innovation and foster the development of new technologies and practices.

Quality assurance is a cornerstone of the role, ensuring that MSMEs maintain high standards in their products and services. NSIC actively supports MSMEs in obtaining necessary certifications and adhering to quality norms, building consumer trust and enhancing market acceptance.

Financial management is vital for the success of MSMEs, and NSIC actively engages in financial analysis, budgeting, and planning. This includes helping MSMEs optimize their financial resources, aiding in efficient fund allocation, and supporting fiscal decision-making.

In essence, working at NSIC is a holistic commitment to the growth and empowerment of MSMEs. It involves providing financial aid, technological support, marketing opportunities, and quality assurance. It's about fostering a vibrant entrepreneurial ecosystem that contributes to the nation's economic development and prosperity.

CHAPTER 3

METHODS AND PROCESSES

3.1 IOT INTEGRATION IN EMBEDDED SYSTEMS

Within the burgeoning field of the Internet of Things (IoT), the seamless integration of embedded systems stands as a foundational pillar. This subtopic delves into the methodologies and approaches essential for effectively fusing IoT technologies into embedded systems. Understanding the intricacies of various communication protocols and frameworks is pivotal to establishing efficient data exchange and connectivity between devices. Additionally, the optimization of power consumption and resource utilization within embedded IoT devices is a key consideration. Striking the right balance is crucial to ensure prolonged operational life without compromising on performance. Moreover, gaining insights into emerging IoT standards and technologies plays a significant role in the creation of robust embedded systems. These systems can seamlessly connect and interact with the Internet of Things, thus enabling a myriad of applications and functionalities ranging from smart homes to industrial automation.

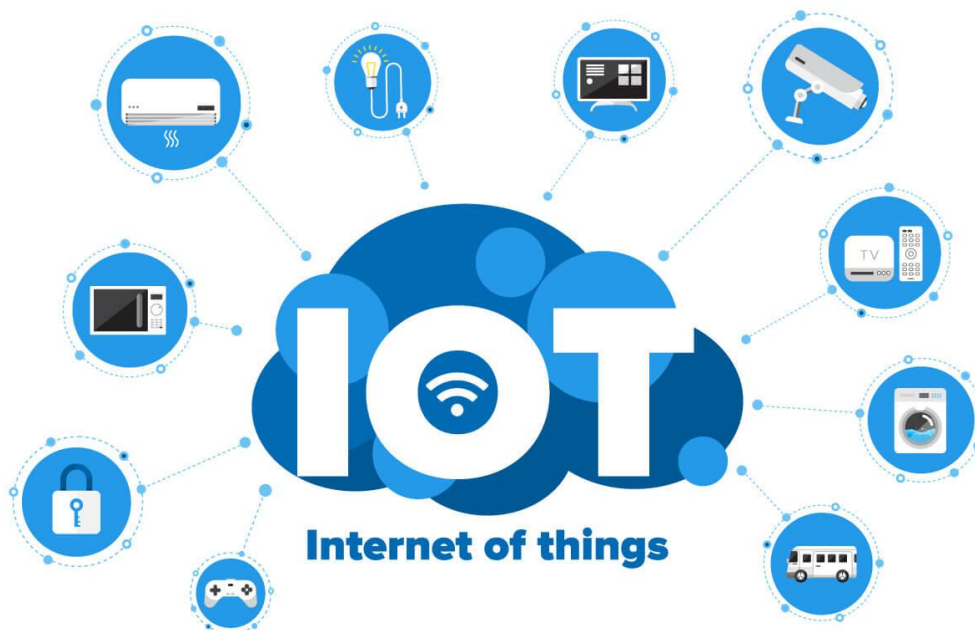


Figure 3.1 IOT

3.2 SECURITY IN EMBEDDED IOT DEVICES

Security is an undeniable concern in the domain of IoT, particularly when intertwined with embedded systems. This subtopic delves into the methodologies and best practices essential for fortifying embedded IoT devices against the ever-evolving landscape of cyber threats and unauthorized access. It entails implementing robust encryption algorithms, multifactor authentication mechanisms, and stringent access control strategies to ensure data privacy and integrity. Moreover, exploring advanced security measures like secure boot and secure firmware updates becomes crucial to mitigate potential vulnerabilities. Creating resilient communication channels between embedded devices and IoT platforms, incorporating multi-layered security protocols, is fundamental for establishing a secure environment for seamless data transmission. Understanding these intricate security aspects is indispensable to foster trust and reliability in embedded IoT systems, enabling their seamless integration into various applications. This integration is vital while safeguarding sensitive data and ensuring the overall robustness of the IoT ecosystem.

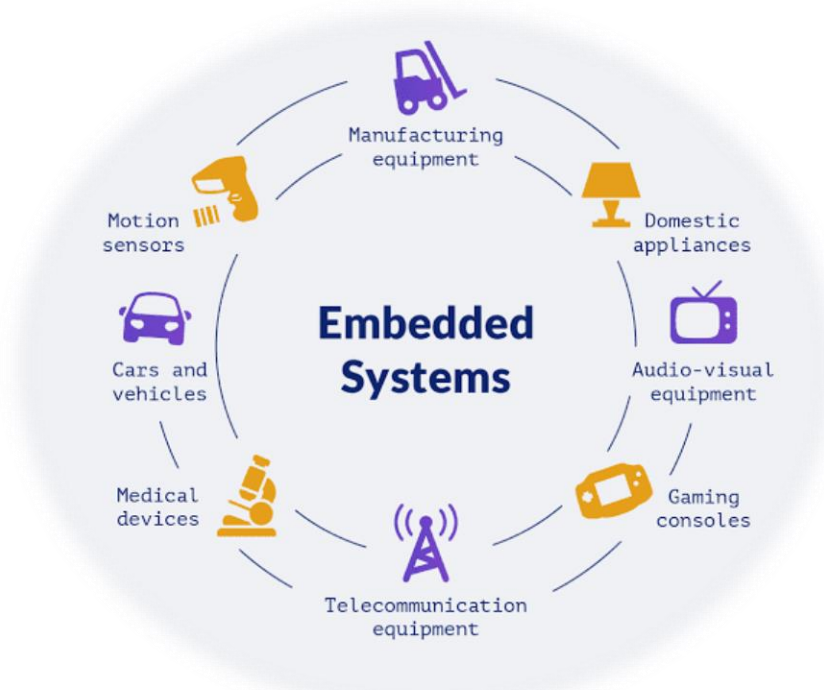


Figure 3.2 Embedded System

3.3 IMPLEMENT IN REALTIME

To implement real-time data processing and analytics in embedded IoT systems, the initial step involves setting up robust data acquisition from various sensors and devices linked to the embedded system. This data encompasses critical parameters such as temperature, humidity, pressure, or other relevant metrics based on the specific application. The core of the implementation lies in configuring the embedded system for edge computing, enabling preliminary data processing and analysis directly on the device. This is achieved through the integration of software frameworks or platforms adept at handling these tasks at the edge. Following data acquisition, preprocessing techniques are applied to clean, filter, and normalize the collected data, ensuring its optimal format for subsequent analysis. The real essence of real-time data analytics unfolds as machine learning algorithms or statistical models are employed to derive meaningful insights and trends from the preprocessed data. This analytical layer allows the embedded IoT system to make informed decisions promptly, setting the stage for an efficient and responsive IoT ecosystem.

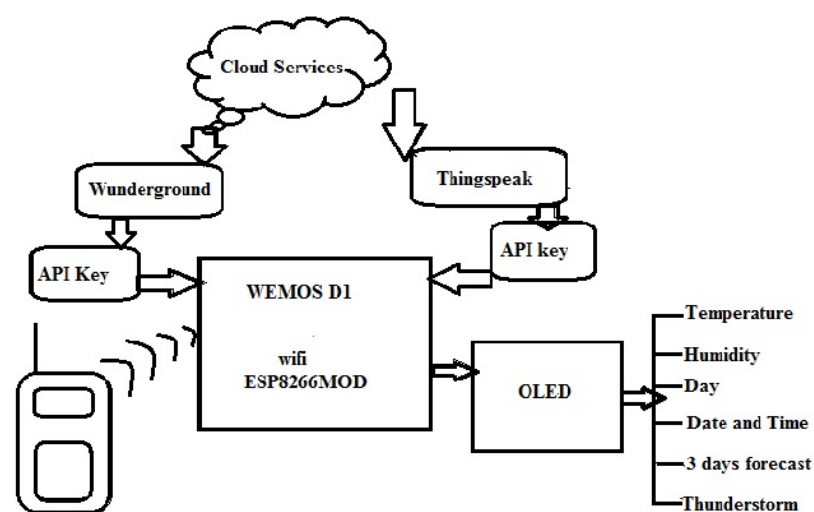


Figure 3.3 Realtime Weather monitoring System

CHAPTER 4

KNOWLEDGE AND EXPERIENCE

4.1 KNOWLEDGE GAINED

4.1.1 UNDERSTANDING FUNDAMENTAL ELECTRONIC COMPONENTS

In the initial phase of the internship, a substantial focus was placed on gaining in-depth knowledge about fundamental electronic components like resistors, capacitors, inductors, and transistors. Understanding the principles governing these components, including their electrical properties, behaviors under varying conditions, and their diverse applications, was paramount. Grasping how resistors control current flow, capacitors store energy, inductors store magnetic energy, and transistors act as amplifiers or switches provided a foundational understanding. This knowledge was vital as these components are elemental in the construction of electronic circuits, forming the backbone of a wide array of devices and systems.

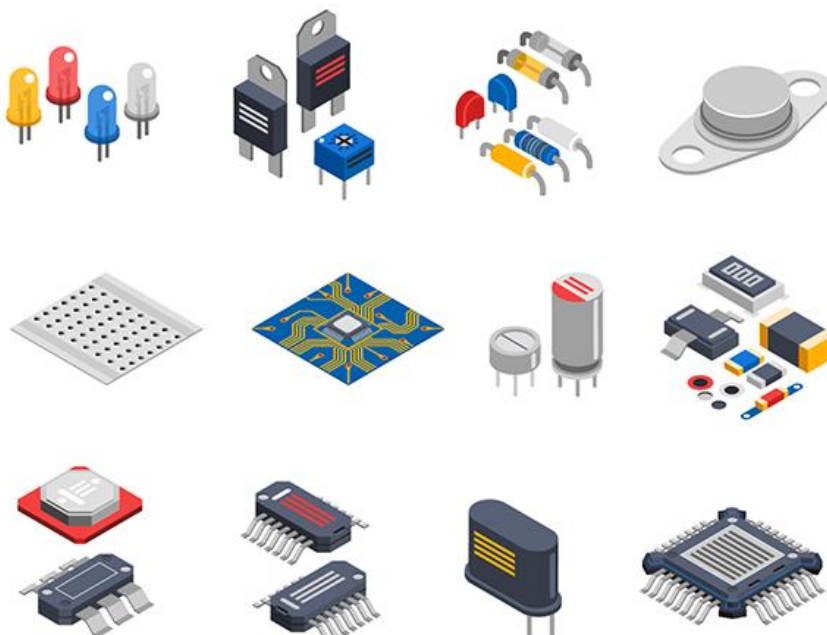


Figure 1

Figure 4.1 Basic Components in Electricals

4.1.2 PRACTICAL CIRCUIT SOLDERING SKILLS

The second day of the internship was dedicated to hands-on learning through practical circuit soldering on Printed Circuit Boards (PCBs). We were introduced to the correct techniques for soldering various electronic components onto PCBs. Learning this skill was pivotal for translating theoretical circuit designs into physical, functional circuits. It entailed understanding the appropriate temperature, duration, and method for soldering, ensuring proper connections and overall circuit integrity. Moreover, acquiring proficiency in soldering was fundamental as it directly impacted the durability, reliability, and performance of the circuits we worked on throughout the internship.

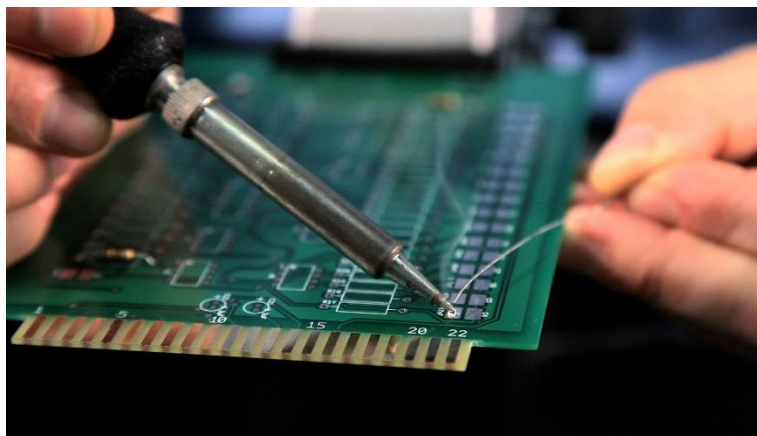


Figure 4.2 Soldering

4.1.3 PROGRAMMING ARDUINO MICROCONTROLLERS

Delving into Arduino microcontroller programming on the third day marked a significant leap into the realm of embedded systems. We started from the basics, understanding the syntax and structure of Arduino programming, and gradually progressed to complex applications. Learning how to interface sensors and actuators, and write code to control and process data from these devices, was instrumental. It enabled us to develop a diverse range of embedded projects, from simple sensor-based systems to more intricate IoT

applications. Acquiring expertise in Arduino programming laid a solid foundation for further exploration into microcontrollers and embedded systems.

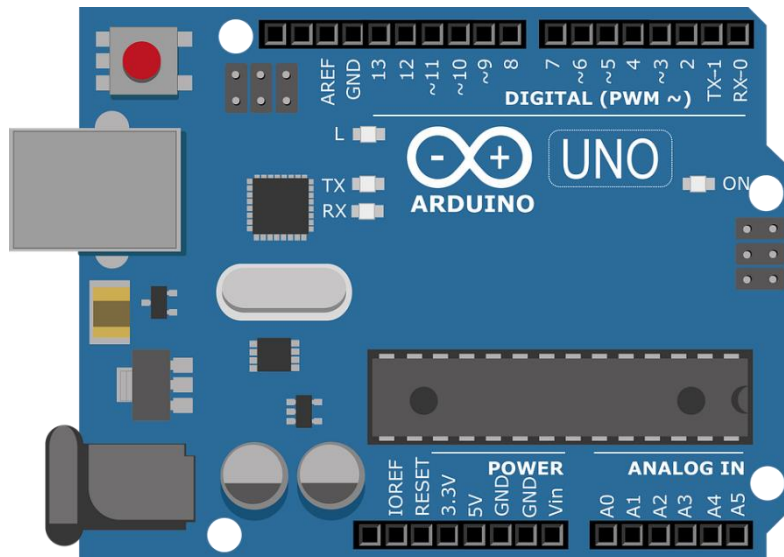


Figure 4.3 Arduino UNO

4.1.4 WORKING WITH SENSORS

The fourth day was dedicated to a comprehensive exploration of various sensors commonly used in electronic circuits. We delved into understanding the principles of operation and applications of sensors like temperature, humidity, proximity, and motion sensors. Hands-on experience with interfacing these sensors with microcontrollers was a crucial aspect, providing insights into how sensors collect data from the environment. Understanding the importance of sensors in the realm of embedded systems and IoT was pivotal, as they serve as the primary data acquisition units, enabling the design of smarter, more responsive solutions for real-world challenges.



Figure 4.4 Sensors

4.1.5 EXPLORING THE 8085 MICROPROCESSOR

Introducing the 8085 microprocessor and delving into its architecture on the fifth day was a significant step towards comprehending more complex computing systems. We explored its internal structure, addressing modes, instruction set, and interfacing techniques. Understanding how the microprocessor executes instructions and processes data was fundamental. We learned about its registers, memory organization, and how it interacts with other components of a computer system. This knowledge formed the basis for the subsequent day's simulation work and laid the groundwork for understanding more advanced microprocessors and controllers in the field of embedded systems.

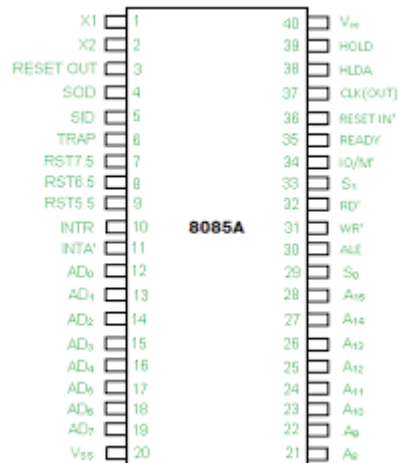


Figure 4.5 Pin diagram of 8085 Microprocessor

4.1.6 FAMILIARIZATION WITH PROTEUS SOFTWARE

The seventh day was dedicated to familiarizing ourselves with Proteus software, a versatile tool for embedded systems development and simulation. We explored its interface, components library, and simulation capabilities. Learning to create and simulate electronic circuits and microcontroller-based projects in a virtual environment was a significant part of the training. Understanding how to design and debug circuits using Proteus equipped us with an essential skill for future projects. This software played a pivotal role in our understanding of circuit behavior, providing a platform for testing and refining our designs.



Figure 4.6 Proteus

4.1.7 PRACTICAL APPLICATION IN REAL-TIME PROJECT

The culmination of our internship on the eighth day was the highlight, involving the practical application of the knowledge and skills gained throughout the internship. We were tasked with creating a patient health monitoring system using IoT. This real-time project allowed us to bring together all the elements we had learned — from fundamental electronic components to microcontroller programming and sensor interfacing. It was an opportunity to apply our knowledge in a real-world context, creating a solution that has the potential to address pressing healthcare needs. The hands-on experience in developing a complete project was invaluable, reinforcing our confidence and competence in working with embedded systems and IoT technologies

4.2 EXPERIENCE

4.2.1 HANDS-ON LEARNING AND PRACTICAL APPLICATION

The internship provided a unique and enriching experience of hands-on learning through practical application. We had the opportunity to move beyond theoretical concepts and actually work with electronic components, microcontrollers, sensors, and simulation software. This hands-on experience allowed us to apply theoretical knowledge in real-world scenarios, enabling a deeper understanding of the subject matter. Whether it was soldering circuits, programming microcontrollers, or simulating complex systems, the practical aspect of the internship was invaluable in shaping our skills and enhancing our confidence in working with embedded systems and IoT.

4.2.2 COLLABORATIVE ENVIRONMENT AND TEAMWORK

Another significant aspect of the internship was the collaborative environment that encouraged teamwork. Working alongside fellow interns and mentors provided exposure to different perspectives and approaches to problem-

solving. Collaborating on projects, sharing ideas, and collectively brainstorming solutions to challenges enhanced our creativity and critical thinking. The experience of working in a team not only mirrored a professional setting but also emphasized the importance of effective communication and cooperation, essential skills in any technological workspace.

4.2.3 PROJECT MANAGEMENT AND TIME-EFFICIENT EXECUTION

The internship presented the opportunity to work on a real-time project, a pivotal experience in project management. We had to manage our time efficiently, ensuring that each aspect of the project, from planning to implementation and testing, was executed within the stipulated timeframe. This experience honed our project management skills, allowing us to comprehend the importance of setting goals, managing resources, and adhering to deadlines. Learning how to balance multiple tasks and prioritize activities for the successful completion of a project was a valuable takeaway from the internship experience.

CHAPTER 5

SUMMARY AND CONCLUSION

5.1 SUMMARY

The internship at NSIC was a comprehensive exploration of Embedded Systems integrated with the Internet of Things (IoT). Commencing with fundamental electronic components understanding and practical soldering skills, the learning curve escalated to encompass programming Arduino microcontrollers, interfacing with various sensors, exploring the architecture of the 8085 microprocessor, and simulating operations using Proteus software. The pinnacle of this educational journey was the practical application in crafting a real-time IoT-based patient health monitoring system. This hands-on culmination highlighted the practical synthesis of the knowledge acquired during the internship. It was a holistic experience that not only broadened

theoretical understanding but also refined practical skills essential in the realm of embedded systems and IoT.

Throughout this internship, a wealth of knowledge was amassed. Starting with the basics, we gained insights into the behavior and functionality of fundamental electronic components. The journey continued, introducing us to the art of circuit soldering, Arduino programming intricacies, sensor functionality, and the architecture of microprocessors. Each day unfolded new layers of understanding, providing a strong foundation for subsequent learning. The real-time project, crafting a patient health monitoring system, was the zenith of this educational expedition. It was a testament to the practicality and applicability of the knowledge assimilated during the internship.

The internship offered not only knowledge enhancement but also a plethora of enriching experiences. Hands-on learning was a significant aspect, allowing us to move beyond theoretical concepts and truly engage with electronic components and simulation software. Furthermore, the collaborative environment fostered teamwork, encouraging diverse perspectives and effective communication. Additionally, managing a real-time project honed our project management skills, teaching us the importance of efficient time utilization and resource management. These experiences collectively elevated our confidence and competence in working with embedded systems and IoT, setting a strong foundation for a promising career.

5.2 CONCLUSION

In conclusion, the internship at NSIC was a transformative journey delving into the intricacies of Embedded Systems and the Internet of Things (IoT). Beginning with fundamental electronic components and circuit soldering skills, we progressed through programming microcontrollers, interfacing sensors, and understanding microprocessor architecture. This laid the groundwork for the

pinnacle of the internship - the development of a real-time patient health monitoring system using IoT.

The knowledge acquired during the internship was comprehensive and practical. From the rudiments of electronic components to advanced microcontroller programming and simulation, each stage enriched our understanding. The practical application in the final project was a testament to the assimilation of this knowledge, reinforcing its real-world relevance.

Beyond knowledge, the internship provided invaluable experiences. Hands-on learning, collaboration, and project management honed our skills and highlighted the significance of effective teamwork and efficient execution. These experiences not only shaped us as professionals but also instilled confidence in tackling real-world challenges.

In essence, this internship equipped us with the theoretical understanding, practical skills, and experiential learning necessary for a successful career in the dynamic field of Embedded Systems and IoT. It was a journey of growth, learning, and empowerment, paving the way for future innovation and contributions to the ever-evolving technological landscape.

CHAPTER 6

APPENDIX



Figure 6.1 Internship Certificate