Internship – II Report
on
Embedded System

Submitted in Partial fulfillment for the award of degree of Bachelor of Technology in Electronics & Communication Department

**Rajiv Gandhi Proudyogiki Vishwavidyalaya,
Bhopal (M.P.)**

Submitted By:
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Under the Guidance of
Professor
Sanjay Gupta

**DEPARTMENT OF
Electronics & Communication**

**Jai Narain College of Technology, Bhopal
Approved by AICTE New Delhi & Govt. of M.P.
Affiliated to Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.)**

Session: 2024 – 2025

DEPARTMENT OF

ELECTRONICS & COMMUNICATION

CERTIFICATE

This is to certify that the work embodied in this Internship, Report entitled as "Embedded System" being Submitted by Payal Mehra– 0131EC221023 in partial fulfillment of the requirement for the award of "Bachelor of Technology" in Electronics & Communication discipline to Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.) during the academic year 2023-2024 is a record of bonafide piece of work, carried out under my supervision and guidance in the Department of Electronics & Communication, Jai Narain College of Technology, Bhopal.

Approved by

Guided by
Prof. Sanjay Gupta

Head of Department
Prof. Amzad Quazi

Dean, Academics

Dr. Vivek Dubey

Principal

Dr. Netra Pal Singh

DEPARTMENT OF

ELECTRONICS & COMMUNOCATION

CERTIFICATE OF APPROVAL

This Internship "Embedded System" being submitted by Payal Mehra-0131EC221023 has been examined by me & hereby approve for the partial fulfillment of the requirement for the award of "Bachelor of Technology in Electronics & Communication", for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein, but the Project only for the purpose for which it has been submitted.

INTERNAL EXAMINER   **EXTERNAL EXAMINER**

Date: **Date:**

CANDIDATE DECLARATION

I hereby declare that the Internship presented in the report entitled as "**Embedded System**" submitted in the partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Front-end Development of Jai Narain College of Technology, Bhopal is an authentic record of our own work.

I have not submitted the part and partial of this report for the award of any other degree or diploma.

Payal Mehra 0131EC221023

Date

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Guided By:
Prof. Sanjay Gupta Sir

ACKNOWLEDGMENT

I am heartily thankful to the Jai Narain College of Technology for providing us all the facilities and infrastructure to take our work to the final stage.

It is the constant supervision, moral support and proper guidance of our respected **Principal** Prof. Dr. Netra Pal Singh and **Dean Academics** Prof. Dr. Vivek Dubey, who motivated throughout the work. We express a deep sense of gratitude and respect to our learned guide Prof. Amit Sawaskade, Professor in the Program of Front-end Development, during all phases of my work. Without his enthusiasm and encouragement this dissertation would not have been completed. His valuable knowledge and innovative ideas helped us to take the work to the final stage. He has timely suggested actions and procedures to follow for which we are really grateful and thankful to him.

I express our gratitude to Prof. Sanjay Gupta Head of Embedded System. Department for providing all the facilities available in the department for his continuous support, advice, and encouragement during this work and also to help to extend our knowledge and proper guidelines.

Constant help, moral and financial support of our loving parents motivated us to complete the work. I express our heartfelt thanks to all our family members for their cooperation.

I really admire the fond support of our class-mates for their cooperation and constant help. It gives immense pleasure to acknowledge the encouragement and support extended by them. Last but not the least we are extremely thankful to all who have directly or indirectly helped us for the completion of the work.

Payal Mehra – 0131EC221023

JAI NARAIN COLLEGE OF TECHNOLOGY, BHOPAL
Approved by AICTE New Delhi & Govt. of M.P. & Affiliated to
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.)

Abstract

Embedded systems have become a fundamental component of modern technology, enabling intelligent functionality in a vast range of devices and applications. An embedded system is a specialized computing unit designed to perform dedicated tasks, often operating within the constraints of limited memory, processing power, and energy consumption. Unlike general-purpose computers, embedded systems are tightly integrated with the hardware they control, allowing them to deliver high reliability, real-time performance, and efficiency. Their applications span numerous domains, including consumer electronics, automotive systems, industrial automation, healthcare devices, aerospace, telecommunications, and smart home technologies.

The architecture of an embedded system typically consists of a microcontroller or microprocessor, sensors, actuators, communication modules, and application-specific software. The software is usually optimized for deterministic behavior, ensuring that tasks are executed within strict timing requirements. Real-time operating systems (RTOS) are often employed when multiple concurrent processes must be managed reliably. The design of embedded systems involves balancing trade-offs between cost, performance, power consumption, size, and functionality. Additionally, the increasing integration of wireless connectivity and Internet of Things (IoT) capabilities has expanded the role of embedded systems from isolated units to interconnected devices capable of data exchange and remote monitoring.

Recent advancements in embedded technologies—such as low-power processors, advanced sensors, machine learning at the edge, and improved communication protocols—have contributed to the development of smarter and more autonomous systems. These enhancements have introduced new opportunities but also new challenges. Security has become a critical concern, as embedded devices connected to the internet may be vulnerable to cyberattacks. Ensuring data privacy, secure communication, and robust system behavior is essential, especially in safety-critical applications like medical devices or automotive control systems. Furthermore, the complexity of embedded software continues to increase, necessitating the use of sophisticated development tools, simulation environments, and verification techniques to ensure reliable operation.

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INDEX

Embedded System:

1. Introduction

1.1 Background: Briefly describe the organization and its industry.

. Embedded systems are specialized computing systems designed to perform dedicated functions within larger mechanical or electrical systems. Unlike general-purpose computers, which can run a wide variety of applications, embedded systems are optimized for specific tasks such as monitoring, controlling, or managing hardware operations. They combine hardware components like microcontrollers, sensors, and actuators with software programmed to carry out predefined operations efficiently and reliably.

1.2 Objective of the Internship: State the purpose and goals of the internship.

The main objective of the internship was to gain **hands-on industry experience** and apply the theoretical concepts learned in the classroom to **real-world Hardware development**. Specific goals included:

- Understanding software project workflows and team collaboration.

- Enhancing programming and problem-solving skills.

- Learning about modern development tools and technologies used in the industry.

1.3 Organization Profile

MSME Technology Centre (TC) is a network of technical institutions established by Ministry of Micro, Small and Medium Enterprises (MSME), Government of India, under the overarching initiative to support and strengthen Micro, Small and Medium Enterprises (MSMEs) across the country. The centres act as common-facility hubs — offering advanced manufacturing infrastructure, design and development capabilities, skill development programmes, consultancy, and quality-enhancement support to MSMEs.

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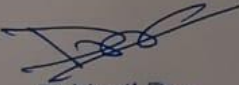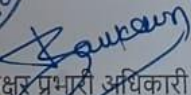
Embedded System :

1.4 Internship Certificate

Embedded System :

भारत सरकार
Government of India
सूक्ष्म, लघु एवं मध्यम उद्यम मंत्रालय
Ministry of Micro, Small & Medium Enterprises
विकास आयुक्त का कार्यालय
Office of Development Commissioner

Certificate No.: 57030/E-SDP/2024-25/16

प्रतिभागिता प्रमाण-पत्र
Certificate of Participation

प्रमाणित किया जाता है कि **सुश्री पायल मेहरा** सुपुत्री श्री महेश मेहरा ने संस्थान द्वारा आयोजित उद्यमिता-सह-कौशल विकास कार्यक्रम (ई-एसडीपी), दिनांक 06/01/2025 से 15/02/2025 तक, विषय एम्बेडेड सिस्टम स्थान एमएसएमई प्रौद्योगिकी केंद्र भोपाल (सिटी सेंटर) ३५ ,एमपीएलएन बिल्डिंग , इमामी गेट सर्किल , सुल्तानिआ रोड , पीर गेट एरिया पर सफलतापूर्वक पूर्ण किया है |

This is to certify that Ms. PAYAL MEHRA D/o. Mr. MAHESH MEHRA has successfully completed the **ENTREPRENEURSHIP-CUM-SKILL DEVELOPMENT PROGRAMME (E-SDP)** during the period from 06/01/2025 to 15/02/2025 on the topic EMBEDDED SYSTEM organized at MSME TECHNOLOGY CENTRE BHOPAL (CITY CENTRE) 35, MP LUN BUILDING, IMAMI GATE CIRCLE, SULTANIA RD, PEER GATE AREA.

स्थान / Place : BHOPAL
दिनांक / Date : 25-07-2025

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एमएसएमई-विकास कार्यालय/ब्रांच डीएफओ/प्रौद्योगिकी केंद्र
Signature of Officer In-charge MSME DFO/Branch
DFO/Technology Centre
MSME-TC - BHOPAL
Seal with name and Designation

Embedded System :

Embedded System:

2. Internship Activities

2.1 Description of Tasks and Responsibilities

The tasks and responsibilities in an embedded system role involve both hardware and software activities required to design, develop, test, and maintain embedded solutions. The responsibilities typically include understanding system requirements, implementing embedded software, integrating hardware components, and ensuring reliable system performance. The main tasks undertaken in the embedded system domain are described below

2.2 Projects/Modules Undertaken
The modules developed and tested during the internship included:

- User Authentication Module – For secure login and role-based access.

- Attendance Recording Module – For capturing daily check-in and check-out data.

2.3 Tools and Technologies Used

☐ Keil uVision

MPLAB X IDE

☐ Arduino IDE

☐ Code Composer Studio

☐ Eclipse IDE

☐ GCC Compiler

☐ XC8 Compiler

☐ Proteus Simulation

Embedde System:

2.4 Skills Acquired

2.4.1 Professional Skills

- Embedded C / C++ Programming
- Microcontroller & Microprocessor Knowledge
- Circuit Design & Hardware Interfacing
- Sensor and Actuator Integration
- Real-Time System Development
- RTOS Concepts (Task Scheduling, Interrupt Handling)
- Debugging and Troubleshooting

2.4.2 Technical Skills

Embedded C / C++ Programming
Ability to write efficient, low-level code to control microcontrollers and hardware peripherals. These

Knowledge of programming controllers like PIC, AVR, ARM, STM32, ESP32, and 8051.

Creating and updating the software that runs directly on embedded hardware

2.4.3 Personal Growth

Daily reflection on thoughts, emotions, and behaviors

Clear, measurable short-term and long-term goals

SMART framework implementation

Milestone tracking and review cycles

Embedded System:

3. Challenges and Solutions

3.1 Challenges Faced: Describe any difficulties you encountered.

Embedded systems play a crucial role in modern electronics, but their development. One major challenge is limited hardware resources. Embedded devices often have memory, processing power, and storage, which makes it difficult to run complex algorithms or applications. Developers must optimize code efficiently to fit within these limitations.

3.2 Solutions and Strategies: How did you overcome these challenges?

To overcome these challenges, I referred to **official documentation**, online tutorials, and project guidelines to understand the framework better. With the help of my **team mentor**, I resolved configuration errors and improved debugging techniques. I also adopted better **time management strategies**, using tools like **Trello** to track progress and prioritize tasks. Regular discussions with team members helped me improve collaboration and gain confidence in completing assigned work efficiently.

Embedded System:

4. Conclusion

The internship experience at **MSME Tecnology Center Bhopal.** was a valuable and enriching phase of my academic journey. It provided me with **practical exposure** to real-world Hardware processes and strengthened my understanding of **Embedded System**.

Through hands-on work, I enhanced my **technical expertise**, **team collaboration**, and **problem-solving** skills. The internship also improved my communication abilities and taught me how to manage Aurdino projects in a professional setting.

Overall, the experience has motivated me to pursue a career in **Hardware engineering and Embedded System**, with a strong focus on continuous learning and innovation.

Front-end Development

5. Appendices

- Screenshots of developed project modules.

- Database ER diagram of the Attendance Management System.

- Weekly progress and task reports.

Front-end Development

6. References

1. MSME Tecnology Center Bhopal MP. – Internal documentation and project manuals.

2. Oracle Java Documentation – https://docs.oracle.com

3. MySQL Reference Manual – https://dev.mysql.com/doc

4. Apna College

5. Greek For Greek

6. W3Schools Tutorials – https://www.w3schools.com