ADICHUNCHANAGIRI UNIVERSITY

Faculty of Engineering, Management and Technology
(BGS Institute of Technology)

BG Nagara-571448, Mandya District, Karnataka, India

An Industrial Internship Report on

LI-ION BATTERY CHARGER OF SPECIFICATION 25.9V

submitted by

JARIKALA H D

21ECE067

in partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING
in
ELECTRONICS AND COMMUNICATION ENGINEERING

INTERNSHIP CARRIED OUT AT

Info Systems

National Award for Indigenisation | Specialized in R&D and Manufacturing of Industrial, Military & Aerospace Grade Equipment

FEBRUARY 2025

Adichunchanagiri University
Faculty of Engineering, Management and Technology
(BGS Institute of Technology)

BONAFIDE CERTIFICATE

This is to certify that the Summer Industrial Internship report entitled "**Li-ion Battery Charger Of Specification 25.9V"** submitted by **JARIKALA H D(21ECE67)** to B G S Institute of Technology, Adichunchanagiri University, B G Nagara in partial fulfilment of the requirement for the award of the degree of **Bachelor of Engineering** in **Electronics and Communication Engineering** is a record of bonafide Industrial Internship undertaken by him/her under my supervision. The training fulfils the requirements as per the regulations of this Institute and in my opinion, meets the necessary standards for submission. The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Project Supervisor	**Co-ordinator**	**Head of the Depatment**
Mrs. Lakshmi D L, BE, MTech (Ph.D)	Dr. Naveen B	Dr. Naveen K B
Assistant Professor,	Associate Professor,	Professor,
Department of ECE	Department of ECE	Department of ECE
BGSIT, ACU	BGSIT, ACU	BGSIT, ACU

Internal Examiner (s)	**External Examiner (s)**
Name :	**Name :**
Designation:	**Designation:**
Institute :	**Institute :**

DECLARATION BY THE CANDIDATE

I, **JARIKALA H D**, bearing USN **21ECE067**, a student of final year Bachelor of Engineering in Electronics and Communication Engineering from BGS Institute of Technology, Adichunchanagiri University, B G Nagara, hereby declare that the report entitled **"LI-ION BATTERY CHARGER OF SPECIFICATION 25.9V"** under the supervision of my external guide **Mrs. VANITHA**, Manger-Engineering and my internal guide **Mrs. LAKSHMI D L**, Assistant Professor, Dept. of ECE, BGSIT, ACU, B G Nagara, Submitted in partial fulfillment for the award of degree Bachelor of Engineering in Electronics and Communication Engineering for the academic year 2024–2025.

I further declare that this Internship report has not been submitted by me to any other university or institution either in part or in full for the award of any degree

Signature of the student

Name:
Reg. Number:

INTERNSHIP CERTIFICATE

Info Systems

National Award for Indigenisation | Specialized in R&D and Manufacturing of Industrial, Military & Aerospace Grade Equipment

Tel/Fax: +91-80-23450226
Email: support@info-systems.in
Web: www.info-systems.in
Address: B-15, BEL Industrial Estate, Jalahalli, Bangalore-560013
GST: 29AACFI1575J1Z5

Ref No: INFO/2573/03-25/INT
Date: 26/03/2025

INTERNSHIP CERTIFICATE

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Jarikala H.D, (21ECE067),** a student of Department of Electronics and Communication Engineering, BGS Institute of Technology, has successfully completed the Internship Program under the guidance of Mrs. Vanitha (Manager-Engineering) at **Info Systems** from **19/02/2025 to 26/03/2025**.

She worked on Battery Charger projects, for several of our clients including Hindustan Aeronautics Ltd (HAL) and Bharat Electronics Ltd (BEL). Her conduct and workmanship during the internship were good.

We wish her all the best in her future endeavors.

Best Regards,

K.C. Jayaprakash

BANGALORE * INFO SYSTEMS *

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ACKNOWLEDGEMENT

It gives me great pleasure in expressing and humble pranamas to his holiness **BYRAVAIKYA JAGADGURU PADMA BHUSHAN SRI SRI SRI Dr. BALAGANGADHARANATHA MAHASWAMIJI** and my sincere thanks to the present pontiff his holiness **JAGADGURU SRI SRI SRI Dr. NIRMALANANDANATHA MAHASWAMIJI** and seek their blessings.

It gives me an immense pleasure to write an acknowledgement to this internship, a contribution of all people who helped me realize it. I would like to convey my heart full thanks to **Dr. B N SHOBHA** our beloved Principal, BGSIT, B G Nagara, for her guidance, technical expertise, encouragement and timely help in making this internship a reality and giving support for my academic endeavors.

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I am heartily thankful to **Mrs. LAKSHMI D L**, Assistant Professor, Dept. of ECE, BGSIT, for **her** guidance, technical expertise, encouragement and timely help in making this internship a reality.

I express my deep sense of gratitude to **Mrs. VANITHA**, Manger-Engineering, Info Systems for **her** guidance, technical expertise, encouragement and timely help in carrying out my internship.

I am extremely thankful to my parents who have been cooperative and helpful during the entire course of the internship.

Once again, I convey my acknowledgment to all people associated with me for the completion of my internship. I thank one and all.

Place : B G Nagar

JARIKALA H D

Date : 27/03/2025

ABSTRACT

During our internship at **INFO SYSTEMS**, I delved into the realm of Research and Development (R&D) and Manufacturing, focusing on the production of industrial, military, and aerospace-grade equipment. One of the key areas of our learning experience was centered around the **Li-ion Battery Charger System**, specifically designed to meet the stringent **specifications of 25.9 volts**. This system plays a crucial role in powering various applications within these specialized sectors, requiring precise engineering and meticulous attention to detail to ensure optimal performance and reliability.

Throughout our internship, I gained valuable insights into the intricacies of designing, testing, and refining Li-ion Battery Charger Systems. I learned about the unique challenges associated with meeting the specific voltage requirements, as well as the importance of safety, efficiency, and durability in such critical applications. My hands-on experience allowed me to understand the complexities involved in developing cutting-edge technology for demanding environments, further enhancing skills and knowledge in the field of electrical engineering and manufacturing.

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CHAPTER 1

INTRODUCTION

1.1 Overview of the internship

Enterprise resource planning (ERP) is a platform companies use to manage and integrate the essential parts of their businesses. Many ERP software applications are critical to companies because they help them implement resource planning by integrating all the processes needed to run their companies with a single system. An ERP software system can also integrate planning, purchasing inventory, sales, marketing, finance, human resources, and more.

- ERP software can integrate all of the processes needed to run a company.
- ERP solutions have evolved over the years, and many are now typically web-based applications that users can access remotely.
- There are hundreds of ERP applications a company can choose from, and most can be customized.
- An ERP system can be ineffective if a company doesn't implement it carefully.

1.2 Objectives of the internship

- **Assembly:**

  Full-fledged manual and automatic assembly facilities for assembling end-to-end product.

- **Testing:**

  Complete set of test & measurement instruments for testing DC/AC, RF, Micro computer and Digital circuits.

- **Environmental Facilities:**

  Temperature chamber with High (+120° C) and Low (-60° C) temperature tests, Bump test, Vibration test and Burn-in chambers.

- **IT Facilities:** End-to-end development using Labview, C, C++, Embedded C, Autocad and Assembly Language.

- **Manpower:**

  Highly skilled and dedicated Engineers and Technicians with extensive experience standard needs of Defence and Aerospace sectors

1.3 Scope of the report

This report shares a thorough look at my internship experience at Let's Pro Academy. I'll cover the training I went through, the methods we used, the tools and technologies we worked with, and the projects I got involved in. You'll see the skills I developed, how I applied what I learned in school to real-life situations, and my overall journey during the internship. I'll also take a moment to evaluate the progress I made and how ready I feel to meet industry standards, plus I'll offer some ideas for boosting my skills even further.

Figure 1.1 : Battery Charger System 25.9V

CHAPTER 2

ABOUT THE ORGANIZATION

2.1 Company profile:

Figure 2.1 Company Logo

Let's Pro Academy was established in 2018 and is located in Vijayanagar, Mysuru. It is one of the top technology-oriented training institutes in Mysore, providing training in various domains such as Web App Development, Android App Development, Machine Learning, Digital Marketing, IoT, Embedded Systems, and more. The academy offers both online and offline training and aims at providing 100% placement support to certified applicants.

2.1.1 Background:

NAME OF THE COMPANY	INFO SYSTEMS
YEAR OF ESTABLISHMENT	1986
CORPORATE ASSOCITE	B-15 BEL INDUSTRIAL ESTATE, JALAHALLI, BANGALORE

2.1.2 Histroy

The company was established in 1986 and is a registered vendor for Defence and Aerospace. Infrastructure is available for design, development and manufacturing of products for Industrial, Telecommunication, Power Electronics and RF Communication applications. Info Systems has highly skilled workforce with 45+ years of experience in Defence and Aerospace standards. The customer base is spread across Defence, Govt. Organizations and other reputed industries.

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2.1.3 Company Registration

Udyam Registration Number – UDYAM-KR-03-0121002

Registered under Ministry of MSME, Govt of India

2.1.4 Vision and Mission:

Vision:

- Design and development of products for defence and aerospace applications
- Manufacturing and supply of Military grade products
- PCB Assembly and Testing
- Cable Assemblies and Wiring Harness
- Build to Spec and Build to Print
- Software development using Lab View, C, C++, Embedded C, Autocad and Assembly Language

Mission:

It is used along with transmitters and receivers of the communication network where Data Carrier stores encrypted hop data parameters used in the network and Net Data Carrier stores encrypted data of the network. It is a national award product which was received in the year 2001 from the Ministry of Defense.

2.2 Areas of expertise:

National Award:

Received National Award for Indigenisation from Ministry of Defence in February 2001 for cost savings of equipment that were earlier imported from Sweden

Figure 2.2 : National Award Receiving

Paper of the Year:

Received "Best Paper of the Year" award from late Shri Rajiv Gandhi (Ex-Prime minister of India) in for presenting a Technical paper on "Control and Monitoring System for Ship Borne Communications" in IETE

Figure 2.3 Best Paper of the Year Receiving Picture

To be a leading provider of innovative solutions, driving customer success through advanced technology, while inspiring our team to achieve excellence and creating lasting value for investors

2.2 Company Details And Information

Company Name: Info Systems

Address: B-15 BEL Industrial Estate , jalahalli , Bangalore-560013

Official Website: http://www.info-systems.in

- The company was established in 1986 and is a registered vendor for Defence and Aerospace.
- Infrastructure is available for design, development and manufacturing of products for Industrial, Telecommunication, Power Electronics and RF Communication applications.
- Info Systems has highly skilled workforce with 45+ years of experience in Defence and Aerospace standards.
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CHAPTER 3

IN-PLANT TRAINING EXPERIENCE

3.1 Works Undertaken

- The working principle of lithium-ion battery means its charging and discharging principle. When charging the battery, lithium ions are generated at the positive electrode of the battery, and the generated lithium ions move through the electrolyte to the negative electrode.
- The carbon as the negative electrode is in the form of a layer structure, which has many micro-pores, and the lithium ions that reach the negative electrode are embedded in the micro-pores of the carbon layer, and the more lithium ions are embedded, the higher the charging capacity.
- By the same token, when the battery is discharged (i.e., the process we use the battery), the lithium ions embedded in the carbon layer of the negative electrode come out and move back to the positive electrode. The more lithium ions that return to the positive electrode, the higher the discharge capacity. What we usually call the battery capacity refers to the discharge capacity.
- Lithium-ion batteries generally require the charging process to be controlled in four stages: trickle charge (low voltage pre-charge), constant current charge, constant voltage charge, and charge termination.
- The basic requirement for charging lithium-ion batteries is a specific charging current and charging voltage, thus ensuring safe battery charging.

3.2 Requirement Specification:

Hardware Tools:

DC to DC CONVERTOR

- Buck PCB: Input - 32V, Output - 20V
- Boost PCB: Input - 20V, Output - 32V

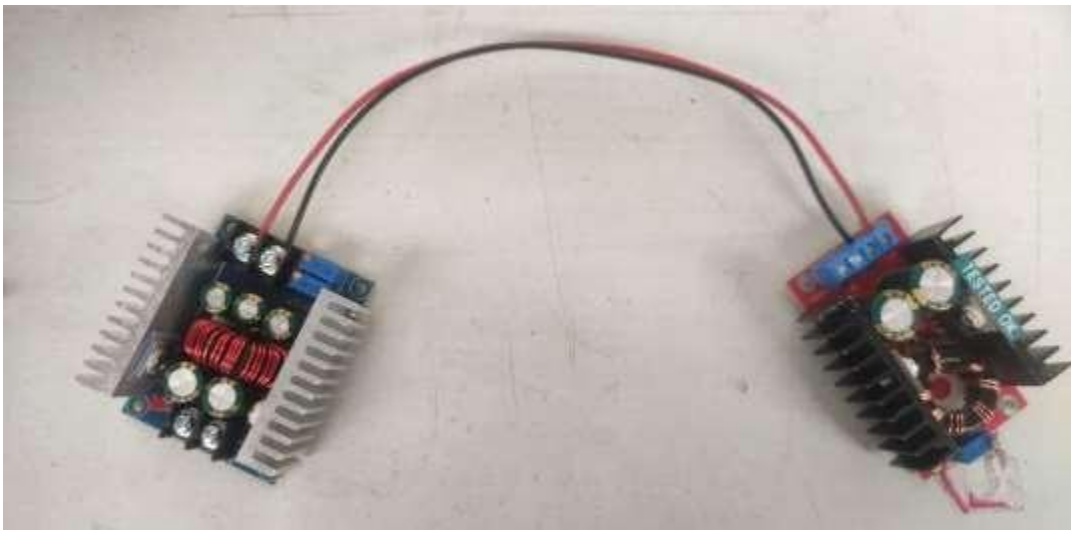

Figure 3.1: Buck and Boost

- **AC to DC CONVERTOR:** Input - 230V(AC), Output - 32V (DC)
- Microprocessor - MSP430F249TPMR

Figure 3.2: AC & DC Conv

Figure 3.3: PCB

SOFTEWARE TOOLS:

- IAR
- CAD
- Schematic editor – KICAD

3.3 Methodology:

Battery Charger System (BCS) has been designed for management of Li-ion batteries. The micro-controller based system considers all the factors so that Li-ion batteries can be charged / discharged effectively. BCS uses sophisticated technology, which provides a safer, more reliable and efficient Li-ion battery management. On detecting the battery, the process of either charge/discharge of that particular battery is initiated. The battery charger is used for charging/maintaining two 25.9V@9Ah batteries at a time.

BCS is a portable system housed in an ABS moulded case. It takes input either from mains 230V-AC or from DC power supply. Since the system weight is around 6Kgs, it is very effective for field use. The moulded case has two compartments - The top cover of the casing houses the power supply module; the bottom case houses a micro-controller based Battery Management Controller Board (BMCB) and a platform with two stations for accommodating two Li-Ion batteries of 25.9V, 9Ah capacity that would require charging.

3.4 Block Diagram

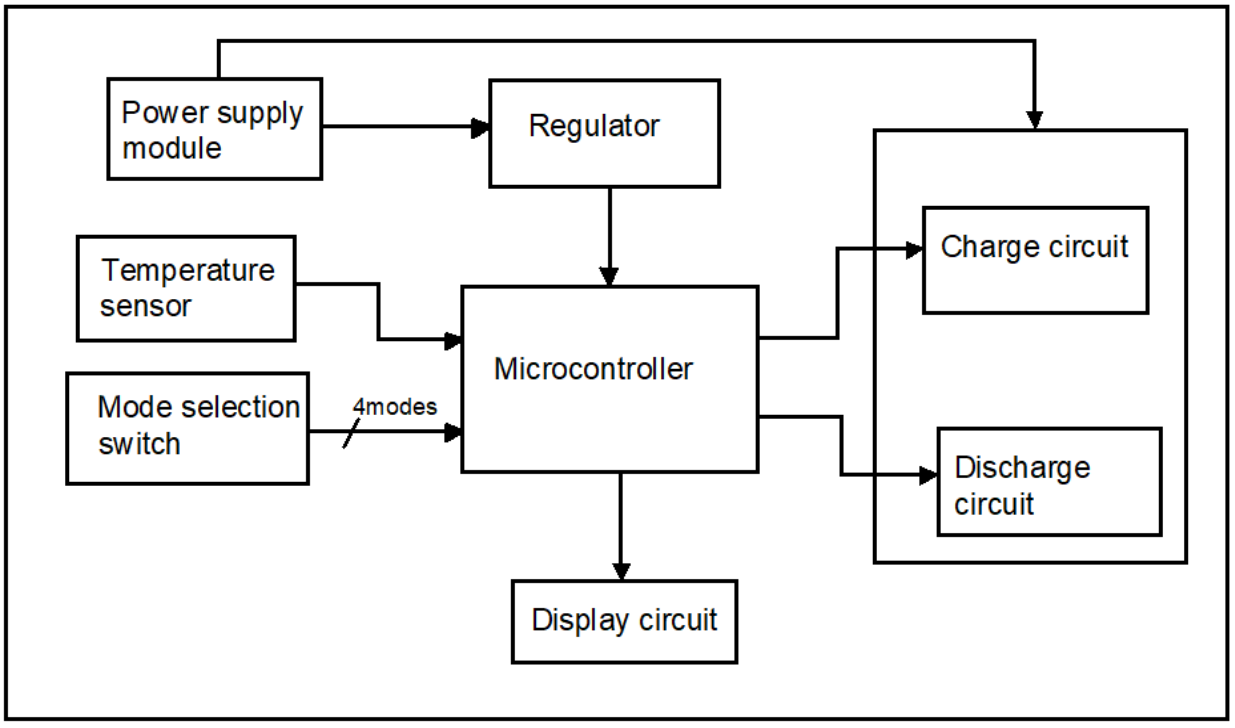

Figure 3.4: Block Diagram

3.5 LEARNING OUTCOMES AND RESULTS

Learning outcomes serves as a roadmap, outlining the key objectives and expectations for training endeavor. It sets the tone for what learners can anticipate achieving through their engagement with the work.

INPUT CONVERTERS

- Pursuing deals with every single aspect, from a basic convertor to the overall working of the battery.
- We learnt in-depth about the tuning technique of inputs to the battery.
- Since the battery contains both ac and dc inputs, it was essential to understand the key elements of ac to dc and dc to dc convertors.
- The project required specific output from the both the convertors such as 32v with 9A current from dc to dc and 230v Ac converter to 32v dc from ac to dc convertor.

PCB TESTING

- This process gives greater insight into the technological and core knowledge of Electronics.
- The process of testing the board is an essential aspect of entire project, as the whole battery system relies on this board for it functioning.
- It involves,
- testing the input voltage drop across the regulators mounted on the PCB board
- testing the board with no load condition to ensure certain condition such as ideal board operation with load, verifying whether the microprocessor is successfully programed, cross checking components with respect to positive and negative terminals, voltage drops at particular input points.
- Testing the board with load to minimize errors after assembling board into battery box.

BATTERY CHARGER TESTING

- This process provided us enormous information about various conditions that a battery must withstand or co-operate for its smooth functioning.
- Temperature testing is an essential test with which we ensure that the battery operate smoothly at the specified temperatures. Overall testing was done to ensure the eligibility of entire battery system for usage.

3.6 Hands on Experience and Projects:

Figure 3.5: Li-ion Battery

Components:

A lithium-ion battery consists of three main parts:

Anode: The negative electrode, typically made of carbon (graphite).

Cathode: The positive electrode, often made of a lithium-containing metal oxide or phosphate.

Electrolyte: A liquid or gel substance that allows lithium ions to move between the anode and cathode.

Separator: A thin, porous membrane that prevents the anode and cathode from physically touching, which would cause a short circuit, but allows lithium ions to pass through.

CHAPTER 4

APPLICATION OF ACQUIRED KNOWLEDGE

4.1 Sample Project Demonstration

- **Modes of Charging:**

1. Regulation Mode:

to constant voltage mode to eliminate overcharging and charges up to 29.5V. In regulation mode, the battery is charged at constant current mode of 2.2A current. When the battery voltage reaches 28.9V, the charger switches

2. Maintenance Mode:

In maintenance mode, the battery is charged up to 27.5V with 1.1A of current. If the battery voltage is greater than 27.5V then the battery will discharge up to 27.5V with 1.1A of current.

3. Discharge Mode:

In discharge mode, if the battery voltage is greater than 25V then only battery will be discharge up to 25V with 2.2A of current. If the battery voltage reaches 25V, discharge will cut off automatically. Only one battery can be discharged at a time.

- **AC-DC Module**

AC-DC module is used to provide the output of 32V, 6A currents. Input of the AC-DC module is in between 160V AC to 260V AC.

- **Charging Module**

A battery charging system includes a first charging circuit connected in series with polarity of battery cells for controlled current charging. A second charging circuit applies a controlled voltage across each individual cell for equalization of the cells to the fully charged condition. There are two modes of charging:

a) Constant current charging mode: In the Constant current charging mode, battery will be charged at a constant current of 2.2A. As the battery voltage increases above 28.9V the constant current charging mode is off.

b) Constant voltage charging mode: In the Constant voltage charging mode, battery will be charge at a constant voltage of 28.9V. Charging current will decrease as the battery voltage increases. The charging stops as soon as charging current decreases below 0.25A.

CHAPTER 5

SELF-EVALUATION AND SKILL ENHANCEMENT

Expectations of Internship:

Internship is the one which traditionally refers to the real-world work experience in which student full-fill short term position within company. I gained a new sense of professional is m and a clearer view of what it meant to be in the professional world .I gained an in-depth understanding of the web designing. Experience like this has allowed myself to work to a higher standard and to care for the individuals I work with. This internship also gave me an exposure to numerous design software that engineers use together to maintain a success full operation.

Practical Skills:

The Internship has provided the opportunity to connect classroom theory with current industry challenges, and provide exposure to the latest technologies. Opportunities to converse and interact with a large pool of talented experienced department members has provided a deeper insight to the overall operation, and valuable pool of resources to assist in completion of internship program. This internship program was exactly what I needed to nurture my practical skills. I have acquired practical experience to complement the theoretical content of my studies.

Leadership Skills:

Leadership skills are the tool, behaviors, and capabilities that a person needs to be successful in motivating and directing others. Yet true leadership skills involve something more; the ability to help people grow in their own abilities. It can be said that the most successful leaders are those that drive other to achieve their own success. I gained leadership skills from my supervisor during the internship period which includes managing time, motivating individuals, giving feedback, and giving effective guidance.

Work Ethics Related Issues:

Aninternshipisanopportunitytolearntheskillsandbehaviorsalongwiththework values that are required for success in the workplace. Workplace ethics are established codes of conduct that respect the values of the organization or company where you are employed.

Time Management:

If you have managed to successfully take a full course load every semester and meet assignment deadlines to some extent you have already demonstrated time management skills. But as an intern, you are not going to have a syllabus to tell you when your deadlines are. It is up to you to organize your time and produce results. Employers want to know that you can prioritize responsibilities and recognize when it's appropriate to multitask or focus on one particular project at a time.

Resource Utilization Skills:

Resource utilization refers to the process of making the most of the resources available to you to achieve the objective that you want to. This could be with respect to organization where a project needs to be executed and then resources, both human and nonhuman are allocated onto the project depending on skills and availability. Or, on a personal front, your individual project and the utilization of your resources for the same could also be called resource-utilization.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 FUTURE SCOPE

I gained so much experience from this Internship. If I did not have this experience, it would be very hard for me to find a suitable job. As we know finding work can be a challenge in this competitive world. In my career opportunity, this internship will support me. And my future scopes will be after a good internship:

- I can work in a government job.
- Working as a PCB designer is possible.
- Can pursue career in Design Engineer.
- Working as a PCB Assembly Technician is a possibility.

Skills Acquired

Internships served as valuable opportunities for me to gain practical experience in a specific field. The skills acquired during this process is as follows:

- As intern I had opportunity to work on actual projects, collaborate with professionals, navigate the challenges of the workplace, professional conduct and develop positive attitude.
- Internship at the industrial sector offers hands-on experience which helped in binding the gap between academics and real-world application.
- Working on actual projects presents lot of challenges which requires critical thinking and problem-solving skills to overcome the issue. As intern I learnt to analyze issues, identify solutions and make decisions to overcome such obstacles.
- Overall period as an intern improved my communication skills by interacting with colleagues, superiors, and sometimes clients.

6.2 CONCLUSION

As we all know, our country is a developing country and it dreams to be a developed country soon. Hence the government has taken many necessary projects to fulfilling the concept of digital India. Day by day our job sector is getting more and more competative. As a result, every other company is searching for experienced candidates. Finally, I can claim it is internship that helps me gain experience. Thanks to Info system , I gained so much more in- depth knowledge of technical skills and personal skills This project helped me gather theoretical and practical knowledge about IAR, CAD, KICAD and other programming language. Beforehand I was confident about designing and developing some PCB design circuit Now I am also confident and competent in complete 2 side design . For those students who are willing to work as Hardware design then this is one of the best career kick starts. I got very good opportunity to work with this company which they make work for the government and the Indian army. My internship company gave me a good scope to learn and discover my potentials. I am very grateful to them. Now I can design PCB and test the code for that I was fortunate for getting the chance to meet the Hardware development environment.

REFERENCE AND APPENDICES

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WEEKLY OVERVIEW OF INTERNSHIP ACTIVITIES

WEEK 1 In the week one, the HR of the company introduced about the company and their achievements in them along with transmitters and receivers of the communication network where Data Carrier stores encrypted data parameters used in the network and Net Data Carrier stores encrypted data of the network.

WEEK 2 In the week two, they include us as a team and involved in several tasks for implementing the charger specification of 25.9V. Involved in Research and Selection for select a charger that matches the specifications of your battery type.

(e.g., lithium-ion, lithium-polymer).

WEEK 3 In the week 3, Purchase the charger from a reliable manufacturer or supplier known for quality and safety standards. Testing and Validation before regular use, test the charger with your battery to ensure it charges correctly without overheating or overcharging. some safety Considerations Ensuring the charger has built-in safety features such as overcharge protection, short circuit protection, and temperature monitoring to prevent overheating.

WEEK 4 In the week 4, I have gained knowledge about some Integrate the charger into your charging routine for devices or batteries that require 25.9 volts. Ensure it is stored in a safe and accessible location and Maintenance Periodically clean the charger and inspect for any signs of wear or damage.