POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

FINAL REPORT
DIPLOMA KEJURUTERAAN ELEKTRONIK (KOMUNIKASI)
SESI I 2024/2025

ELECTRICAL ENGINEERING TRAINER APP

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CONFIRMATION OF THE PROJECT

The project report titled "Electrical Engineering Trainer" has been submitted, reviewed, and verified as a fulfills the conditions and requirements of the Project Writing asstipulated.

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Supervisor’s name : Puan Nor Rofizah binti Abdul Mutalib

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Verified by:

Project Coordinator name :

Signature of Coordinator :

Date :

ENDORSEMENT

"I hereby acknowledge that I have read and I find that its content meet the Requirements in terms of scope and quality for the Diploma in Electronic of Communication."

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DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE: ELECTRICAL ENGINEERING

TRAINER APP SESSION: SESI 1 2024/2025

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   (hereinafter referred to as the 'Polytechnic')

2. We hereby declare that 'Electrical Engineering Trainer' and the intellectual property contained are our own original work in which no part has been taken or copied from other parties.

3. We agree to surrender the rights of Electrical Engineering Trainer the intellectual property to the 'Polytechnic' in fulfilment of the requirements of Diploma in Electrical Engineering.

Made and in truth that is recognized by;

a) Awang Ahmad Hariz Mustaqeem bin Awang Ahmad Syafrinidjem
   (Identification card No: - (040525-14-0337)

   (.....)
   AWANG AHMAD HARIZ MUSTAQEEM
   BIN AWANG AHMAD SYAFRINIDJEM

   In front of me, Puan Nor Rofizah bin Abdul Mutalib
   (820404-11-5378)

   (.....)
   PUAN NOR ROFIZAH BINTI ABDUL MUTALIB

   As a project supervisor, on the date:

ACKNOWLEDGEMENTS

All the praise and thanks to Allah SWT. I am very thankful to my supervisor Puan Nor Rofizah bin Abdul Mutalib whose encouragement, guidance, and support from the initial to the final level enables me to continue to develop an understanding of the subject.

I am really grateful because I managed to complete this project within the time given by Puan Rofizah. This project cannot be completed without the effort and help of other members. Next, I would like to express our gratitude to our friends and respondents for their support and willingness to spend more time with me.

I also want to thank my parents who gave me permission and capital expenditure to buy components for my project until it has been successfully done. They have given me all the ease and infinite moral support until I succeeded in my project. They help to answer any questions that we point out to them. Last but not least, we would like to thank those who are directly involved in our final project. Thank you.

ABSTRACT

The Electrical Engineering Trainer project aims to develop a comprehensive, interactive educational platform designed to enhance the learning experience for students in electrical engineering. This project integrates both hardware and software components to create a versatile training system that simulates real-world electrical circuits and systems. The trainer includes a range of modules covering fundamental concepts such as circuit analysis, signal processing, power electronics, and control systems. Through hands-on experimentation and simulation, students can visualize complex electrical phenomena, perform measurements, and analyze results in real-time. The project also incorporates an intuitive user interface, detailed instructional materials, and assessment tools to facilitate self-paced learning and instructor-led training. By bridging theoretical knowledge with practical application, the Electrical Engineering Trainer aims to improve student engagement, comprehension, and proficiency in the field of electrical engineering.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

The Electrical Engineering Trainer project aims to enhance electrical engineering education by providing an interactive platform that combines hardware and software to simulate real-world electrical systems. It offers comprehensive modules covering key topics such as circuit analysis, signal processing, power electronics, and control systems. This trainer enables students to engage in hands-on experimentation, visualize complex phenomena, and perform real-time measurements and analysis. With an intuitive user interface, detailed instructional materials, and assessment tools, it supports both self-paced and instructor-led learning. By bridging theoretical knowledge with practical application,

the trainer prepares students for professional challenges and improves their engagement and comprehension.

1.2 Project Background

The landscape of electrical engineering education faces challenges such as a theoretical focus, outdated laboratory equipment, limited resources, and the struggle to keep pace with technological advancements. To address these challenges, there's a growing need for integrated learning tools that offer interactive learning, real-time feedback, comprehensive modules, and flexibility. While existing solutions like software simulators and hardware kits provide valuable resources, they often fall short in providing a complete educational experience. The Electrical Engineering Trainer project aims to bridge these gaps by developing a comprehensive training platform that integrates hardware and software components, offering modular design, interactive simulations, hands-on experimentation, user-friendly interface, and supporting instructional materials and assessment tools. Ultimately, this project seeks to enhance the learning experience and better prepare students for the demands of the electrical engineering profession.

1.3 Problem Statement

Traditional electrical engineering education often lacks sufficient hands-on experience, leading to disengagement and inadequate preparation for real-world challenges. Outdated lab equipment, limited resources, and inflexible learning environments exacerbate the problem. There is a need for a modern educational tool that integrates theoretical and practical learning, enabling hands-on experimentation, real-time data analysis, and visualization of complex electrical phenomena. The Electrical Engineering Trainer project aims to meet this need by creating an innovative training platform that enhances student engagement, bridges the theory-practice gap, and better prepares students for their professional careers.

1.4 Project Objectives

1.4.1 To design an app that can help students learn and calculate electrical circuits.

1.4.2 To create an app that will scan a circuit. Calculate voltage and amperes. Then show the output of the circuit

1.5 Scope of the Project and Constraints

For electrical technology students that are struggling with understanding circuits

1.6 Project Significance

The Electrical Engineering Trainer project significantly improves electrical engineering education by integrating theory with hands-on practice, enhancing student engagement and readiness for real- world applications.

1.7 Chapter Summary

The chapter explores the challenges inherent in traditional electrical engineering education, including theoretical emphasis, outdated equipment, and limited resources, while identifying the need for integrated learning tools. It introduces the Electrical Engineering Trainer project as a comprehensive solution to these challenges, aiming to bridge the gap between theory and practice by offering hands-on experimentation, real-time feedback, and comprehensive modules. The significance of the project lies in its potential to revolutionize electrical engineering education, enhancing student engagement, comprehension, andreadiness for real-world applications, thereby addressing

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Literature reviews on the Electrical Engineering Trainer provide comprehensive analyses of existing research and scholarship, exploring themes such as educational technology, hands-on learning, student engagement, assessment, and pedagogical approaches. These reviews aim to identify gaps, trends, and areas for further investigation, informing the design, implementation, and evaluation of the Trainer in educational settings. By synthesizing research from various areas, literature reviews contribute to the understanding of engineering education and the role of technology in enhancing learning outcomes.

2.2 Literature Review (Development of an Industrial Electrical Installation Training Unit)

Development of an Industrial Electrical Installation Training Unit

The development of an Industrial Electrical Installation Training Unit aims to bridge the gap between theoretical knowledge and practical skills in electrical engineering education. This training unit is designed to simulate real-world industrial electrical systems, providing students with hands-on experience in installing, configuring, and troubleshooting electrical installations. By incorporating advanced educational tools and technologies, the training unit seeks to enhance the learning experience, improve competency, and prepare students for the demands of the modern industrial environment. This initiative underscores the importance of practical training in fostering a skilled and knowledgeable workforce capable of meeting the challenges of today's electrical engineering industry.

2.2.1 Subtopic Literature (Technological model of training of Masters in Electrical Engineering to electrical installation and commissioning)

The Industrial Electrical Installation Training Unit is a crucial educational tool designed to significantly enhance students' practical skills. Traditional classroom instruction often falls short in providing the hands-on experience necessary for mastering complex electrical systems. This training unit addresses this gap by offering a controlled environment where students can engage in realistic industrial scenarios. They can practice installing electrical circuits, wiring panels, configuring control systems, and troubleshooting common issues encountered in industrial settings. By engaging with these practical exercises, students not only reinforce their theoretical knowledge but also develop critical problem-solving skills and technical proficiency. This hands-on approach ensures that graduates are well-prepared for the practical demands of the electrical engineering industry, making them more competent and confident professionals.

2.3 Literature Review Topic 2

The development of a technological model for training Masters in Electrical Engineering, particularly in the areas of electrical installation and commissioning, has garnered significant attention in academic and professional circles. As the electrical engineering field evolves with rapid technological advancements, there is a growing need for educational programs to adapt and incorporate innovative training methodologies that effectively prepare students for

real-world challenges.

This literature review aims to explore existing research and developments in the technological training of Masters in Electrical Engineering. It will examine various models and approaches used to teach electrical installation and commissioning, evaluating their effectiveness and identifying best practices. The review will also consider the integration of advanced technologies, such as simulation software, virtual labs, and hands-on training units, in enhancing the educational experience.

By synthesizing current findings and insights from scholarly articles, industry reports, and case studies, this literature review seeks to provide a comprehensive overview of the state-of-the-art in electrical engineering education. It will highlight the key trends, challenges, and opportunities in developing a robust technological training model that aligns with the demands of modern industrial practices.

Ultimately, this review aims to inform educators, policymakers, and practitioners about effective strategies for training future Masters in Electrical Engineering, ensuring they are well-equipped with the necessary skills and knowledge for successful careers in the field.

2.4 Chapter Summary

This literature review examines technological training models and practical skills enhancement for Masters in Electrical Engineering, focusing on electrical installation and commissioning. It evaluates the effectiveness of simulation software, virtual labs, and hands-on training units in bridging the gap between theory and practice. The review identifies best practices and emphasizes aligning educational methods with industrial demands. By incorporating realistic training scenarios, these tools improve students' competency and problem-solving abilities. The review highlights the need for continuous innovation in education and recommends integrating more practical training modules to better prepare students for real-world challenges.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

In researching the effectiveness of the Electrical Engineering Trainer in improving education, a mix of quantitative and qualitative methods will be used. Surveys and performance metrics will quantify impact, while interviews and observations provide deeper insights. Sampling will target students, instructors, and institutions. Analysis will involve statistical and thematic techniques. Ethical considerations will be central. Overall, this methodology aims to understand how the Trainer affects electrical engineering education.

3.2 Project Design and Overview

The project aims to evaluate the effectiveness of the Electrical Engineering Trainer in enhancing electrical engineering education through a mixed-methods approach, combining quantitative surveys and qualitative interviews and observations. It seeks to answer key research questions regarding the Trainer's impact on learning outcomes, usability, and influencing factors. The project involves various stages, including preparation, data collection, analysis, interpretation, and conclusion, with a clear timeline and deliverables outlined.

Ultimately, it aims to provide valuable insights to inform educational practices and contribute to the advancement of electrical engineering education.

3.3 Block Diagram of the project.

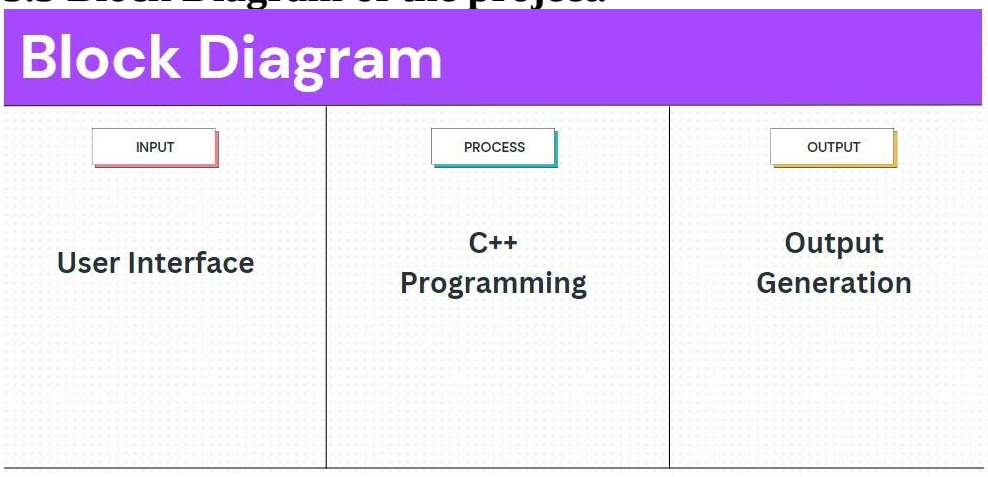


Figure 3.3 Block Diagram for project

3.3.1 Flow Chart Of Electrical Engineering Trainer

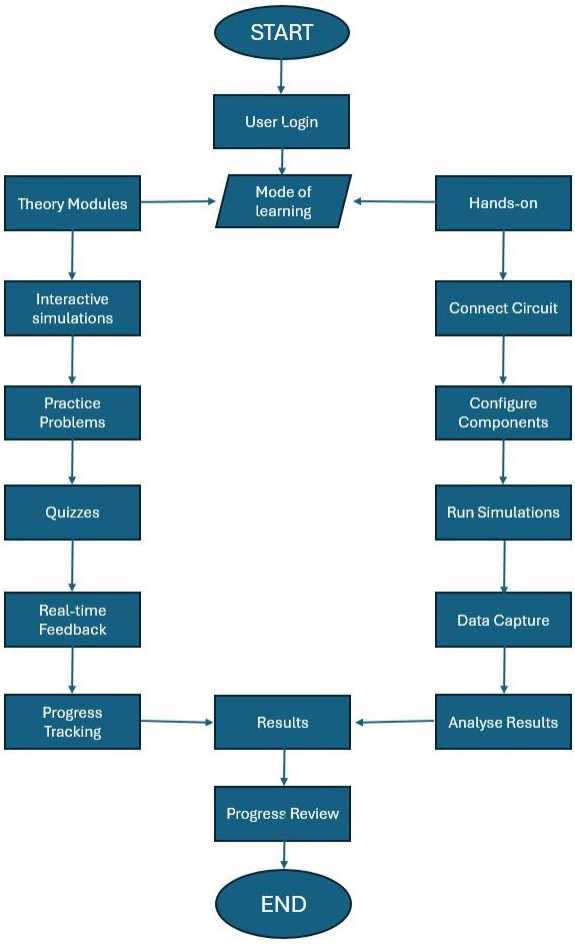


figure 3.3.1 Flow Chart For Project

3.4 Project Description

3.4.1 Project Hardware

The components used for this project are 9V batteries, 3 resistors, a diode, a capacitor, 2 LEDs, and a switch.

Schematic Diagram

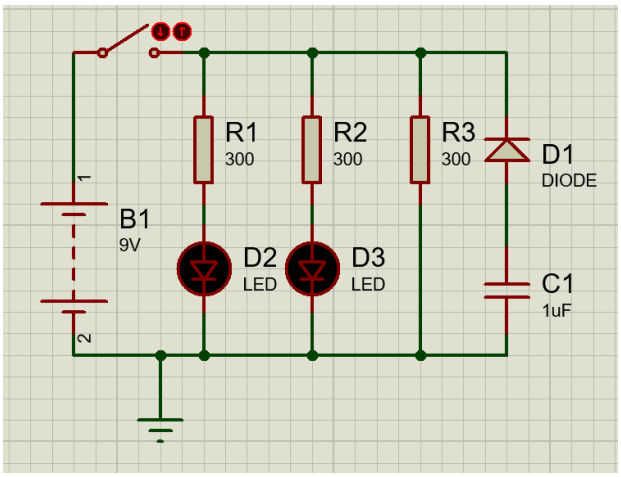


Figure 2 : Circuit diagram

3.5 Description component

3.5.1 Component 1 9V Batteries (Power Source)

9V batteries serve as the power source for the electrical circuit. These batteries are compact, provide a stable voltage output, and are commonly used in various electronic devices and educational projects. They ensure that the circuit receives the necessary energy to function correctly.

3.5.2 Component 2 Resistors

Resistors are passive components that limit the flow of electric current in a circuit. They are used to control voltage and current levels within the circuit, ensuring that components receive the appropriate amount of power. The project includes three resistors, each with a specified resistance value to achieve the desired electrical characteristics.

3.5.3 Component 3 Diode

A diode is a semiconductor device that allows current to flow in one direction only, preventing reverse current that could potentially damage components. In this project, the diode ensures that current flows correctly through the circuit, protecting sensitive components from reverse voltage.

3.5.4 Component 4 Capacitor

A capacitor is an electronic component that stores and releases electrical energy. It is used to smooth out voltage fluctuations, filter signals, and provide temporary power storage in the

circuit. In this project, the capacitor helps stabilize the voltage supply and improve circuit performance.

3.5.5 Component 5 LEDs

LEDs are semiconductor light sources that emit light when an electric current passes through them. The project includes two LEDs, which will serve as indicators to show the status of the circuit. LEDs are energy- efficient and provide clear visual feedback.

3.5.6 Component 6 Switch

A switch is an electrical component that can open or close a circuit, controlling the flow of current. In this project, the switch allows the user to easily turn the circuit on or off. It provides a convenient way to start or stop the operation of the circuit without disconnecting the power source.

3.5.7 Circuit operation

The circuit operation in this project serves as a standalone hardware component designed to complement the software functionality of the Electrical Engineering Trainer App. This circuit is used to simulate real-world electrical scenarios, allowing users to interact with physical systems while analyzing their behavior through the app. It operates by integrating various components such as resistors, capacitors, transistors, and microcontrollers to replicate practical circuit functions like signal processing, power distribution, or control mechanisms. Users can configure the hardware setup, make measurements, and observe the results in real time, enhancing their understanding of the interplay between theory and physical systems. This separation of hardware and software ensures that learners experience both virtual simulations and hands-on experimentation, bridging the gap between digital and physical learning environments.

3.6 Project software

The software component of this project is the core of the Electrical Engineering Trainer App, providing an interactive and immersive platform for learning and practicing electrical engineering concepts. It includes a wide range of features such as circuit design simulations, real-time problem-solving tools, and theoretical modules. Users can experiment with virtual circuits, adjust parameters, and instantly observe the effects, mimicking real-world scenarios without the need for physical components. The app also integrates progress tracking, quizzes, and feedback systems to help users identify their strengths and improve weak areas. By

offering a flexible, user-friendly interface and a variety of learning paths, the software ensures a comprehensive and engaging educational experience, making it accessible to both beginners and advanced learners.

3.7 Chapter Summary

This section focuses on so many different sections which include Introduction, Project design and overview, Block Diagram of the Project. Project description and Description of Main Component,Schematic circuit of project and software used for this project.

CHAPTER 4
PROJECT MANAGEMENT AND COSTING

Introduction

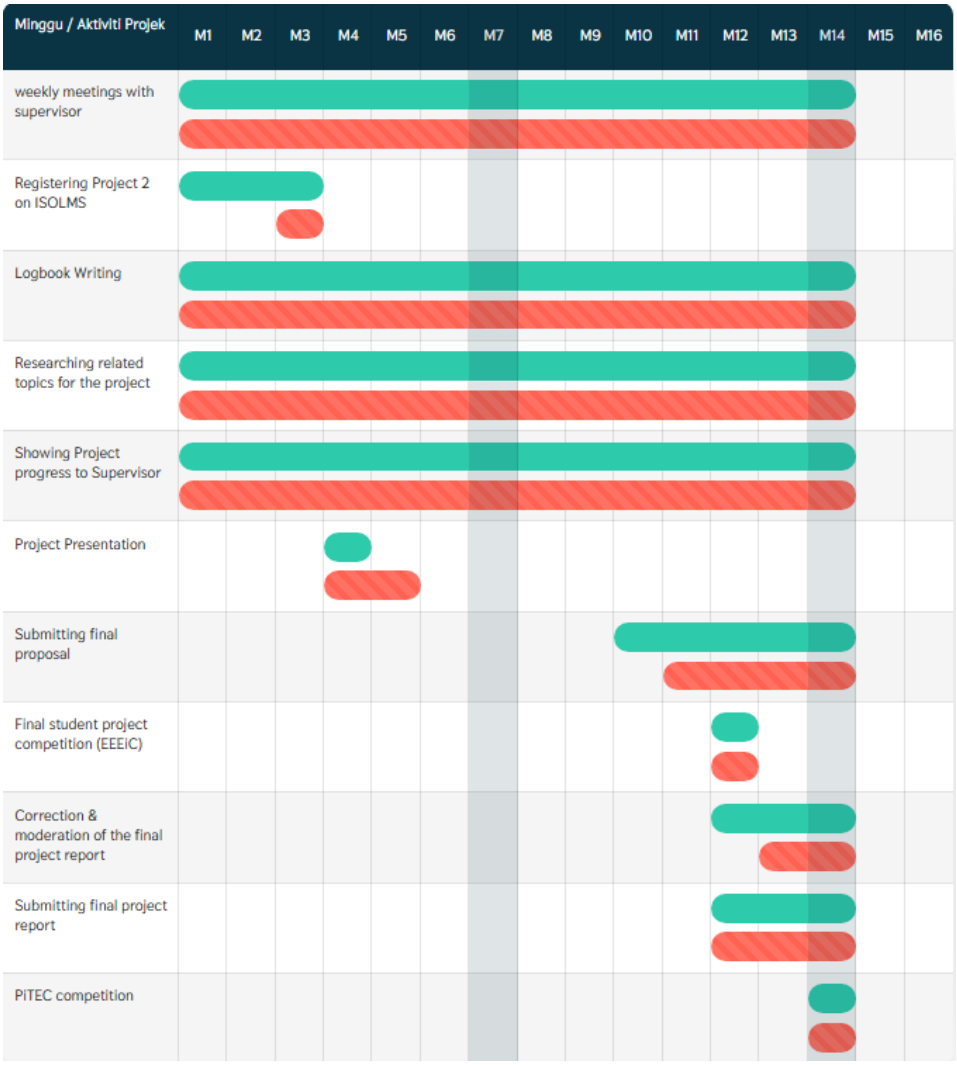
Effective project management and accurate costing are essential for the success of the Electrical Engineering Trainer project, which has a total budget of RM200. Project management involves five key phases: initiation, planning, execution, monitoring and

controlling, and closing, each with specific tasks and deliverables to achieve the project's objectives. Costing includes estimating, budgeting, and controlling costs to ensure the project stays within the RM200 budget. By integrating these practices, the project aims to efficiently use resources, complete on time, and maintain financial accountability, ultimately enhancing electrical engineering education with an innovative training platform.

Cost and Budgeting

No.	Component and materials	The unit price	Quantity	Total
1	Arduino	RM 25.00	1	RM 25.00
2	Resistors	RM 4.00	1	RM 4.00
3	Battery 12V	RM 20.00	1	RM 20.00
4	Capacitors	RM 8.00	1	RM 8.00
5	Other materials	RM 60.00	-	RM 60.00
			Total :	**RM117**
	List of other costing			
1	Transportation			-
2	Postage			-
3	Craft Work			-
4	Internet			-
5	Application			-
			Total :	**-**
			Overall total	**RM200**

Gant Chart and Activities of the Project



CHAPTER 5
Conclusion

This chapter will summarize the results of the tests that have been carried out, including the achievement of objectives and the effectiveness of the system developed in the Smart Save Vault project. In this chapter, it will include an evaluation of how well the project achieved its objectives and an analysis of the system's overall effectiveness in fulfilling the intended goals.

5.1 Conclusion

Conclusion The Electrical Engineering Trainer App bridges the gap between theoretical learning and practical application, offering an innovative solution for mastering electrical engineering concepts. Its interactive software and complementary hardware enable learners to explore, experiment, and gain hands-on experience in a controlled environment. By providing flexibility, real-time feedback, and personalized learning paths, the app empowers users of all levels to develop critical skills and excel in the field of electrical engineering.

5.2 Chapter summary

The Electrical Engineering Trainer App is a comprehensive educational platform designed to enhance learning through virtual simulations and hands-on experimentation. While the software delivers interactive modules and problem-solving tools, the hardware serves as a practical extension for real-world application. Together, they provide a dynamic and flexible learning experience, improving knowledge retention, skill development, and user engagement.

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Technological model of training of Masters in Electrical Engineering to electrical installation and commissioning

-IV Batsurovska (Mykolayiv National Agragian University, 9 Georgya Gongadze, Str., Mykolayiv, 54020, Ukraine)

Development of cooperative learning based electric circuit kit trainer for basic electrical and electronics practice

-M A Hamid, E Permata, D aribowo, I A Darmawan, M nurtanto, and S Laraswati (Department of Electrical Engineering Vocational Education, Faculty of Teacher Training and Education, Universitas Sultan Ageng Tirtayasa, Indonesia)

Electronic Trainer for Educational Purposes

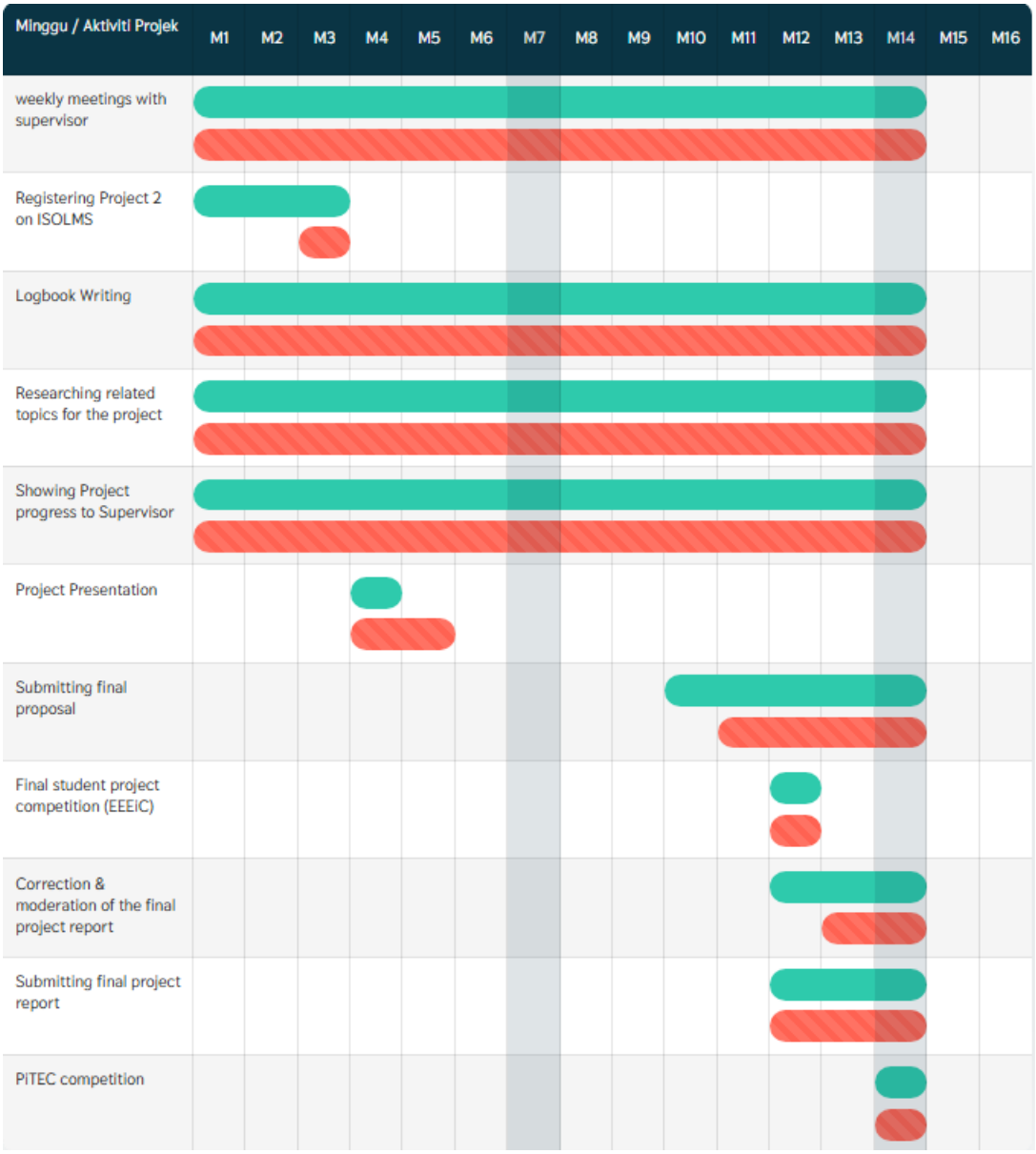
-Sharipah binti Daud, Nor Aizam binti Muhamed Yusof, Shakirah binti Anuar (Politeknik Tuanku Sultanah Bahiyah)

Design and Construction of an Electrical Installation Trainer for Laboratory Experimental

-Muhammad Aulia Rahman Sembiring, Jongga Manullang, Lia Maharani Lubis, Denny Haryanto Sinaga, Reza Arbi Azizi Lubis, Ricky Nelson Tampubolon (Department of Electrical Engineering Education, Faculty of Engineering, Universitas Negeri Medan, Indonesia, Indonesia)

APPENDIX A

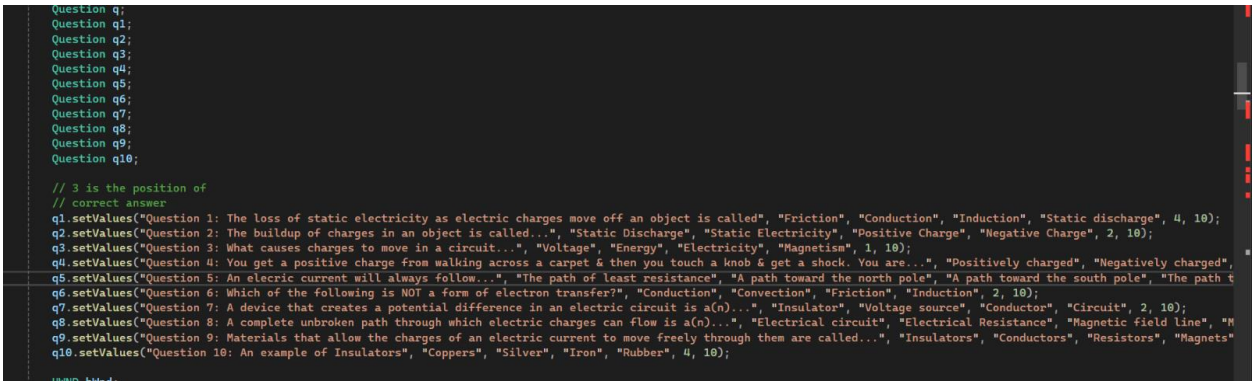
GANTT CHART



C++ Data Sheet

https://hackr.io/blog/cpp-cheat-sheet-pdf

APPENDIX B
Coding screenshot



```
Question q;
Question q1;
Question q2;
Question q3;
Question q4;
Question q5;
Question q6;
Question q7;
Question q8;
Question q9;
Question q10;

// 3 is the position of
// correct answer
q1.setValues("Question 1: The loss of static electricity as electric charges move off an object is called", "Friction", "Conduction", "Induction", "Static discharge", 4, 10);
q2.setValues("Question 2: The buildup of charges in an object is called...", "Static Discharge", "Static Electricity", "Positive Charge", "Negative Charge", 2, 10);
q3.setValues("Question 3: What causes charges to move in a circuit...", "Voltage", "Energy", "Electricity", "Magnetism", 1, 10);
q4.setValues("Question 4: You get a positive charge from walking across a carpet & then you touch a knob & get a shock. You are...", "Positively charged", "Negatively charged",
q5.setValues("Question 5: An elecric current will always follow...", "The path of least resistance", "A path toward the north pole", "A path toward the south pole", "The path t
q6.setValues("Question 6: Which of the following is NOT a form of electron transfer?", "Conduction", "Convection", "Friction", "Induction", 2, 10);
q7.setValues("Question 7: A device that creates a potential difference in an electric circuit is a(n)...", "Insulator", "Voltage source", "Conductor", "Circuit", 2, 10);
q8.setValues("Question 8: A complete unbroken path through which electric charges can flow is a(n)...", "Electrical circuit", "Electrical Resistance", "Magnetic field line", "M
q9.setValues("Question 9: Materials that allow the charges of an electric current to move freely through them are called...", "Insulators", "Conductors", "Resistors", "Magnets"
q10.setValues("Question 10: An example of Insulators", "Coppers", "Silver", "Iron", "Rubber", 4, 10);
```

Coding used

https://drive.google.com/file/d/18bp3bb8Ol1OyhE4Ox9JwpM3y8EP-xM-E/view?usp=sharing

APPENDIX C

Project Result

Despite the best efforts and dedication poured into the development of the project, it failed to be completed within the planned timeline. Several factors contributed to this delay, including unforeseen technical challenges in integrating the software with the hardware, debugging complex issues, and ensuring the app met the desired level of quality and usability. Additionally, time spent refining features and addressing setbacks, while necessary, consumed more resources than anticipated. While the missed deadline was disappointing, the experience highlighted critical areas for improvement and provided valuable lessons that will guide future iterations and ensure the project's ultimate success.