**VIETNAM NATIONAL UNIVERSITY – HO CHI MINH CITY**

**INTERNATIONAL UNIVERSITY**

**SCHOOL OF ELECTRICAL ENGINEERING**



**PROJECT’S TOPIC – LINE 1**

**PROJECT’S TOPIC – LINE 2**

By

**STUDENT’S NAME**

**STUDENT ID**

A THESIS submitted to the School of Electrical Engineering

in partial fulfillment of the requirements for

the degree of Engineer in Control Engineering and Automation

Ho chi minh city, vietnam  
June 2025

**PROJECT’S TOPIC – LINE 1**

**PROJECT’S TOPIC – LINE 2**

BY

**student’s full name**

**STUDENT ID**

Under the guidance and approval of the committee, and approved by its members, this thesis has been accepted in partial fulfillment of the requirements for the degree.

Approved by:

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Committee member

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Committee member

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Committee member

# HONESTY DECLARATION

My name is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (full name). I would like to declare that, apart from the acknowledged references, this thesis either does not use language, ideas, or other original material from anyone; or has not been previously submitted to any other educational and research programs or institutions. I fully understand that any writings in this thesis contradicted to the above statement will automatically lead to the rejection from the Control Engineering and Automation program at the International University – Vietnam National University Ho Chi Minh City.

Date: DD/MM/YYYY

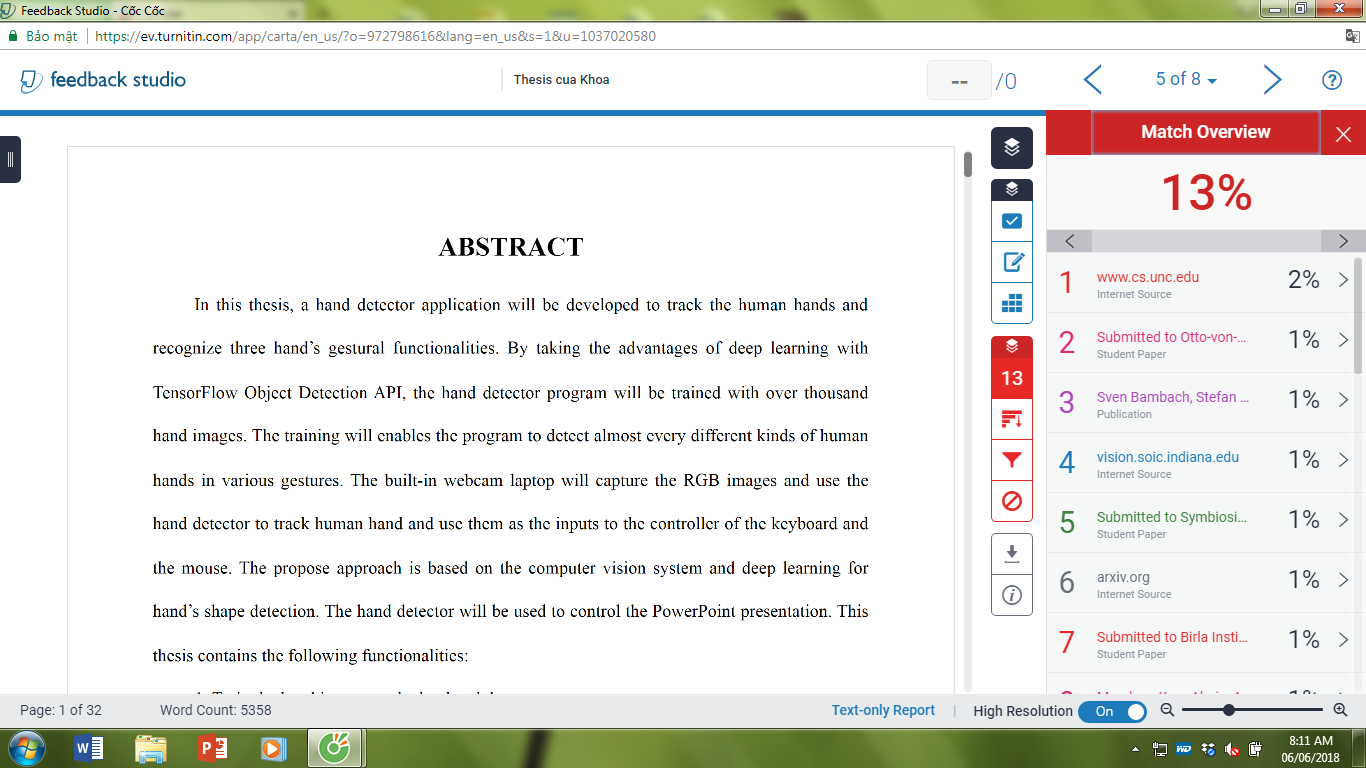
*Student’s Signature*

(Full name)

# TURNITIN DECLARATION

Name of the student: Nguyen Van A

Date: DD/MM/YYYY



Advisor Signature Student Signature

*(Signature) (Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Advisor’s Full Name Nguyen Van A

Date: DD/MM/YYYY Date: DD/MM/YYYY

# ACKNOWLEGMENTS

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………………………

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# ABBREVIATIONS AND NOTATIONS

MAC Medium Access Control

PAN Personal Area Network

*(Should be in alphabetical order)*

# ABSTRACT

Insert abstract here; it should not exceed one page. Abstract text must be double-spaced with no paragraph breaks. Here are some form and style tips: (a) Limit the abstract to one typed page; (b) maintain the scholarly language used throughout the thesis; (c) keep the abstract concise, accurate, and readable; (d) use correct English; (e) ensure each sentence adds value to the reader’s understanding of the research; and (f) use the full name of any acronym used again in the abstract, and include the acronym in parentheses. The abstract should be structured into five key parts: Background, Objective, Methodology, Results, and Conclusion. Do not include references or citations in the abstract.

Keywords: *add max. 5 keywords related to your* thesis *topic (i.e. Internet of Things, Embedded System, Image Processing…).*

# CHAPTER I - INTRODUCTION

Your text should begin from here. This is the illustration for the use of the level-1 title style.

## Level-2 Title (i.e. Context, Background)

Your text should begin from here. This is the illustration for the use of the level-2 title style

### **Level-3 Title**

Your text should begin from here. This is the illustration for the use of the level-3 title style

#### Level-4 Title

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##### **Level-5 Title**

Your text should begin from here. This is the illustration for the use of the level-5 title style

The presence of protein bound carbohydrates in the serum was recognized before …. exception of serum albumin, but are particularly prominent in the c-globulin fractions.

It is well known that the concentration of the glycoprotein in human serum is greatly increased in a number …[[1]](#footnote-1)



**Table 1.1:** Table 1.1’s Name.

|  |  |  |  |
| --- | --- | --- | --- |
| **Circuit** | **Vref (V)** | **Iref (mA)** | **Iref2 (mA)** |
| Circuit 1 | 0.01 | 1 | 2 |
| Cirucit 2 | 0.1 | 2 | 3 |
| Etc. |  |  |  |

**Table 1.2:** Table 1.2’s Name.

|  |  |  |  |
| --- | --- | --- | --- |
| **Circuit** | **Vref (V)** | **Iref (mA)** | **Iref2 (mA)** |
| Circuit 3 | 0.01 | 1 | 2 |
| Cirucit 4 | 0.1 | 2 | 3 |
| Etc. |  |  |  |

Text here…



**Figure 1.1:** Figure 1.1’s Name.

Text here…



**Figure 1.2:** Figure 1.2’s Name.

# CHAPTER II - DESIGN SPECIFICATIONS AND ENGINEERING STANDARDS



## Design Specifications







**Table 2.1:** Table 2.1’s Name.

|  |  |  |  |
| --- | --- | --- | --- |
| **Circuit** | **Vref (V)** | **Iref (mA)** | **Iref2 (mA)** |
| Circuit 1 | 0.01 | 1 | 2 |
| Cirucit 2 | 0.1 | 2 | 3 |
| Etc. |  |  |  |

**Table 2.2:** Table 2.2’s Name.

|  |  |  |  |
| --- | --- | --- | --- |
| **Circuit** | **Vref (V)** | **Iref (mA)** | **Iref2 (mA)** |
| Circuit 3 | 0.01 | 1 | 2 |
| Cirucit 4 | 0.1 | 2 | 3 |
| Etc. |  |  |  |



**Figure 2.1:** Figure 2.1’s Name.

## Engineering Codes and Standards

**Table 2.3:** Engineering Codes and Corresponding Standards.

|  |  |  |
| --- | --- | --- |
| **Element/Product/System** | **Engineering Standards** | **Comments** |
| Arduino Uno R3 | IEC 61010-1 | Safety standard for electrical measurement devices |
| L298N Motor Driver | IPC-2221 | Generic standard for printed board design |
| NEMA 17 Stepper Motor | NEMA MG 1-2016 | Standard dimensions and ratings for motors |
| M5 Screw | ISO 4762 | Hex socket head cap screw specification |
| 2020 Aluminum Profile | ASTM B221 | Aluminum alloy profile extrusion standard |
| Mechanical Systems | ASME B31.3 – Process Piping | Used in refineries, chemical plants, and industrial applications. |
| HVAC Duct Systems | ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality | Specifies ventilation requirements. |
| Pressure Vessels | ASME Section VIII – Boiler & Pressure Vessel Code | Governs design and fabrication of pressure vessels. |
| Civil/Structural Systems | ACI 318 – Structural Concrete Code | Covers concrete design and construction. |
| Steel Structures | AISC 360-16 – Specification for Structural Steel Buildings | Governs steel frame construction. |
| Foundation Design | IS 6403 – Code of practice for determination of bearing capacity of shallow foundations | Provides guidelines for safe foundation design. |

## 

## Realistic Constraints

**Table 2.4:** Realistic Constraints.

|  |  |
| --- | --- |
| **Area** | **Realistic Constraints** |
| Economic | High costs of raw materials (copper, semiconductors), budget limitations in power grid expansion, and cost-effectiveness of renewable energy sources. |
| Environment | Compliance with regulations on e-waste disposal, reduction of carbon footprint in power generation, and impact of electromagnetic fields on the environment. |
| Health and Safety | Electrical shock hazards, fire risks due to faulty wiring, compliance with IEEE/NFPA safety standards, and protection from electromagnetic radiation. |
| Manufacturability | Availability of electronic components (chip shortages), design for mass production, challenges in PCB fabrication, and quality control in semiconductor manufacturing. |
| Sustainability | Use of renewable energy (solar, wind), energy-efficient circuit design, recyclability of batteries, and impact of lithium mining on sustainability. |
| Ethical | Fair labor practices in electronic manufacturing, avoiding conflict minerals in semiconductor supply chains, and ethical AI use in electrical automation. |
| Social | Accessibility of electricity in rural areas, impact of smart grids on society, and cybersecurity concerns in power infrastructure. |
| Political | Government regulations on electrical safety, policies promoting green energy, trade restrictions on electronic components, and national security concerns in telecommunications. |

# CHAPTER III - PROJECT MANAGEMENT

The project management plan is a single, formal, dynamic document that outlines how the project is to be managed, executed, and controlled. It contains the overall project governance and related management plans and procedures, timelines, and the methods and accountabilities for planning, monitoring, and controlling the project as it progresses. This document evolves with the project and will be updated to reflect any relevant changes throughout project execution. This document should ensure there are no surprises through execution on how the project is managed or decisions are made.



## Budget and Cost Management Plan

Provides a description of how the costs of the project will be managed. Provides the details of the cost of all of the components and devices required for the project.

Note: All prices are presented using U.S. number formatting (comma for thousands, period for decimals) as per international reporting conventions. For example, The unit price of an Arduino Uno is 230,000.00 VND, written in U.S. number formatting to align with international engineering documentation standards.

**Table 3.1:** Table of Estimated Costs.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Description** | **Quantity** | **Unit Price (USD)** | **Total Cost (USD)** |
| **Microcontroller** | Arduino Mega 2560 | 1 | $35.00 | $35.00 |
| **Sensors** | Temperature & Humidity (DHT11) | 2 | $5.00 | $10.00 |
| **Power Supply** | 12V DC Adapter | 1 | $15.00 | $15.00 |
| **PCB Fabrication** | Custom Printed Circuit Board | 2 | $20.00 | $40.00 |
| **Wires & Connectors** | Jumper wires, terminals | 1 set | $10.00 | $10.00 |
| **Display Module** | OLED Display 128x64 | 1 | $20.00 | $20.00 |
| **Enclosure** | 3D-printed casing | 1 | $25.00 | $25.00 |
| **Software Tools** | MATLAB License (Student) | 1 | $50.00 | $50.00 |
| **Miscellaneous** | Screws, adhesive, etc. | - | $10.00 | $10.00 |
| **Total Estimated Cost** | | | | $215.00 |

## Project Schedule

This section should describe the approach for creating, updating, and monitoring the project schedule. This section should also include information on the scheduling tools/formats to be used, and schedule development roles and responsibilities. The schedule should account for tasks, priorities, dependencies, and milestones.

A Gantt chart is used to visualize the project timeline, outlining key tasks, dependencies, and milestones. It helps track progress, allocate resources, and ensure timely completion. Regular updates allow for adjustments based on challenges or changes in scope.

## 3.3. Resource Planning

Describes the resource required for the project. Clearly identifies the roles, tasks, and responsibilities for each of the team members.

# CHAPTER IV - LITERATURE REVIEW



## Related Work 1

A "Related Work" section provides an overview of existing research, studies, or projects relevant to your topic. It highlights how previous work has addressed similar problems, identified gaps, and explained how your work builds upon or differs from them. This section helps establish the context and justification for your study.

## Related Research 1

A "Related Research" section summarizes previous studies, theories, and findings relevant to your topic. It highlights key contributions, methodologies, and gaps in existing research, showing how your work connects to and extends prior knowledge. This section helps establish a foundation for your study by demonstrating its significance and originality.

# CHAPTER V - METHODOLOGY



## Flowchart

A flowchart is a visual representation of a process, system, or algorithm using symbols, arrows, and connecting lines. It helps illustrate the sequence of steps, decisions, and interactions within a workflow. Common symbols include rectangles for processes, diamonds for decisions, and arrows to indicate the flow of operations. Flowcharts are widely used in programming, business processes, and system designs to improve understanding and efficiency.

## Dataset

A dataset is a structured collection of data, typically organized in tables, files, or databases. It consists of records (rows) and attributes (columns) that represent information related to a specific domain. Datasets are used in machine learning, research, and data analysis to train models, identify patterns, and derive insights. They can be classified as structured (e.g., spreadsheets, databases) or unstructured (e.g., images, text, audio). The quality, size, and relevance of a dataset significantly impact the accuracy and effectiveness of data-driven applications.

## Proposed Model

A Proposed Model refers to a newly designed framework, system, or methodology introduced to address a specific problem. It is typically based on insights from existing research but improves upon limitations or introduces novel approaches. The proposed model includes details about its architecture, components, working principles, and expected outcomes. It is often validated through experiments, simulations, or real-world applications to demonstrate its effectiveness compared to existing methods.

# CHAPTER VI - RESULTS



## Results

## Discussions

* + 1. **Discussion 1**

The Discussion of Results section analyzes and interprets the findings obtained from experiments or data analysis. It explains the significance of the results, compares them with previous studies, and highlights patterns, trends, or unexpected outcomes. This section also discusses possible reasons for variations, limitations of the study, and potential improvements. The goal is to provide a clear understanding of how the results support or challenge the research objectives and hypotheses.

* + 1. **Discussion 2**

The Results Discussion section provides an in-depth analysis and interpretation of the findings. It examines their significance, compares them with prior research, and identifies key patterns or anomalies. Additionally, it explores possible explanations for the observed outcomes, acknowledges any limitations, and suggests areas for improvement. This section helps contextualize the results, demonstrating how they align with or differ from expectations and existing studies.

* + 1. **Discussion 3**
    2. **Iterative Decision-Making Process**

**Table 6.1:** Iterative decision-making process.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Objectives** | **Problems** | **Iterative Process** | **Decision Making** | **Achieved/**  **Overcome** | **Improvements needed** |
| **Objective 1** | **Problem 1** | **Approach 1**: …  **Approach 2**: … | - Compare solutions (PROs & CONs), Justify final choice,  - Analyze why **Approach 2** did not work | - Did the approach solve the problem?  - Any measurable success? | - What could be improved?  - Alternative solutions? |
| **Problem 2** | **Approach 1**: …  **Approach 2**: … | Write a reason why **Approach 1** is selected |  |  |
| **Objective 2** | **Problem 1** | **Solution 1**: …  **Solution 2**: … | - Justification for choosing one solution over the other | - Successes and challenges faced | - What refinements would make the solution better? |
| **Problem 2** | **Solution 1**: …  **Solution 2**: … |  |  |  |
| **Objective 3** | **Problem 1** | **Method 1**: …  **Method 2**: …  **Method 3**: … | - Performance evaluation, effectiveness of the method | - Were there limitations? How can the process be optimized? | - Performance evaluation, effectiveness of the method |
| **Problem 2** | **Method 1**: …  **Method 2**: …  **Method 3**: … |  |  |  |
| **Problem 3** | **Method 1**: …  **Method 2**: …  **Method 3**: … |  |  |  |

# CHAPTER VII - CONCLUSION AND FUTURE WORK



## Conclusions

The Conclusion of a thesis report summarizes the key findings, reinforces the significance of the research, and reflects on its contributions. It restates the main objectives and how they were achieved, highlights important insights, and discusses the broader implications. Additionally, the conclusion may address the study's limitations and suggest directions for future research. It serves as a final statement that ties together the research and its impact.

## Future Work

The Future Work section of a thesis outlines potential directions for extending or improving the research. It identifies limitations of the current study and suggests areas where further investigation, enhancements, or applications could be explored. This section may propose refining methodologies, testing with larger datasets, applying the model in real-world scenarios, or integrating new technologies. It helps guide future researchers in building upon the existing work and advancing the field.

# CHAPTER VIII - BUSINESS, SOCIAL AND ETHICAL CONSIDERATIONS

* 1. **Business Considerations**

It is discussed how the findings of the research might be utilized within business contexts. Influences on business strategies, impacts on profitability, and implications for management practices are analyzed. The potential applications of the research findings are identified, and recommendations for business stakeholders are proposed.

* 1. **Social Considerations**

The effects of the research on society are examined. Benefits to society, potential improvements in quality of life, and contributions towards solving social issues are evaluated. It is argued how the research could address societal challenges and the social relevance of the findings is highlighted.

* 1. **Ethical Considerations**

The ethical standards adhered to during the research are detailed. It is described how the rights and well-being of participants were protected, how consent was obtained, and how confidentiality and integrity of the research process were maintained. The ethical implications of the research findings are also discussed, emphasizing the importance of ethical considerations in the dissemination and application of the research results.

# REFERENCES

|  |  |
| --- | --- |
| [1] | C. N. E. Anagnostopoulos, "License plate recognition: A brief tutorial," *IEEE Intelligent transportation systems magazine,* vol. 6, no. 1, pp. 59–67, Jan. 2014. |
| [2] | W. Jackson, *Learn Android App Development*, Apress, 2013. |
| [3] | K. Aida-zade, E. Mustafaev, and J. Hasanov, "Intelligent reading system based on mobile platform," in *International Conference on Problems of Cybernetics and Informatics*, Baku, Azerbaijan, 2012, pp. 1-4. |
| [4] | A. Mutholib, T. S. Gunawan, and M. Kartiwi, "Design and implementation of automatic number plate recognition on android platform," in *International Conference on Computer and Communication Engineering*, Kuala Lumpur, Malaysia, 2012, pp. 540–543. |
| [5] | (A reference list of 20 or more sources is encouraged) |
|  |  |

# APPENDICES

The Appendices section in a report includes supplementary materials that provide additional information but are not essential to the main content. It may contain raw data, detailed calculations, extended tables, code snippets, questionnaires, or any supporting documents referenced in the report. Appendices help keep the main text concise while allowing readers to access extra details if needed. Each appendix is labeled (e.g., Appendix A, Appendix B) and referenced in the main document for clarity.

1. *Footnote* [↑](#footnote-ref-1)