POLITEKNIK

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SHOPPING CART WITH ELECTRONIC WEIGHING SCALE

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JABATAN KEJURUTERAAN ELEKTRIK

SESI 1 2022/2023

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This report submitted to the Electrical Engineering Department in fulfillment of the requirement for a Diploma in Electrical Engineering

JABATAN KEJURUTERAAN ELEKTRIK

SESI 1 2022/2023

CONFIRMATION OF THE PROJECT

The project report titled "Shopping Cart with Electronic Weighing Scale" has been submitted, reviewed, and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

Checked by:

Supervisor’s name : Puan Nik Rabiahtul Mujahadah bt Abd Rahman

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Verified by:

Project Coordinator name :

Signature of Coordinator :

Date :

"I acknowledge this work is my own work except the excerpts I have already explained to our source"

Signature :

Name : **Nurina Nadira Bt Azmi**

Registration Number : **08DEP20F1055**

Date :

DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : SHOPPING CART WITH ELECTRONIC WEIGHING SCALE

SESSION: **SESI 1 2022/2023**

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2. I acknowledge that 'The Project above' and the intellectual property therein is the result of our original creation /creations without taking or impersonating any intellectual property from the other parties.

3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meet the requirements for awarding the **Diploma in Electrical Engineering** to me.

Made and in truth that is recognized by;
a) **Nurina Nadira bt Azmi**) .
(Identification card No: - (020429-14-1390) ....…………………………
) **Nurina Nadira Bt Azmi**

In front of me, **Puan Nik Rabiahtul Mujahadah bt Abd Rahman** (820404-11-5378)) .....………………
As a project supervisor, on the date:) **Puan Nik Rabiahtul Mujahadah bt Abd Rahman**

ACKNOWLEDGEMENTS

I have taken efforts in this Project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them. I am highly indebted to Puan Nik Rabiahtul Mujahadah bt Abd Rahman for their guidance and constant supervision as well as for providing necessary information regarding the Project & also for their support in completing the Project.

I would like to express my gratitude towards my parents & classmates for their kind co-operation and encouragement which help me in completion of this Project. I would like to express my special gratitude and thanks to industry persons for giving me such attention and time.

My thanks and appreciations also go to my colleague in developing the Project and people who have willingly helped me out with their abilities.

ABSTRACT

Customers need to wait for a long queue to weigh items at shopping mart which cause to waste a lot of time and the risk for being in crowded especially during this pandemic. To overcome the problem, I've decided to design and construct a small weighing scale machine that can weigh items specifically for groceries. This will help customer from the need to wait for a long queue and these devices are pocket-sized with easily read display screens making them easy to use, store and transport, and can even be measure items accurately for items from 0-5 kg. The only real disadvantage is that it requires a battery charge or power source to operate also can't weigh items from 5 kg and above. It's a project which is a shopping cart with electronic weighing scale which the project has hardware and software category that can weigh items also can display weigh of items. This device will be installed at shopping cart to use at shopping mart with the target audience is surely for adults or we could say customers that came to buy some groceries at mart and want to weigh some of their groceries items but want to avoid the need to queue and wasting time to weigh the items which got accurate measurements on items with weigh capacity from 0-5 kg equivalent to 0 lb to 11 lb, that obviously to weight items such as fruits/vegetables.

TABLE OF CONTENTS

CONFIRMATION OF THE PROJECT	**i**
DECLARATION OF ORIGINALITY AND OWNERSHIP	**iii**
ACKNOWLEDGEMENTS	**iv**
ABSTRACT	**v**
TABLE OF CONTENTS	**viii**
LIST OF TABLES	**ix**
LIST OF FIGURES	
LIST OF SYMBOLS	**1**
LIST OF ABBREVIATIONS	**1**
CHAPTER 1	1
1 INTRODUCTION	2
	3
1.1 Introduction	3
1.2 Background Research	4
1.3 Problem Statement	4
1.4 Research Objectives	4
1.5 Scope of Research	**5**
1.6 Project Significance	**5**
1.7 Chapter Summary	5
CHAPTER 2	
2 LITERATURE REVIEW	
2.1 Introduction	
2.2 Motor Skill Challenges in Autistic Children (Literature Review Topic 1)	6
2.2.1 Previous Research (Subtopic Literature Review Topic 1)	6
2.3 Control System (Literature Review Topic 2)	7
2.3.1 Microcontroller	
2.3.2 Programmable Logic Control (PLC)	
2.3.3 Arduino	

2.4 Chapter Summary 8
CHAPTER 3 9
3 RESEARCH METHODOLOGY 9
3.1 Introduction 9
3.2 Project Design and Overview. 9
3.2.1 Block Diagram of the Project 9
3.2.2 Flowchart of the Project 2 10
3.2.3 Project Description 12
3.3 Project Hardware
3.3.1 Schematic Circuit 12
3.3.2 Description of Main Component 12
3.3.2.1 Component 1 13
3.3.2.2 Component 2
3.3.2.3 Component 3
3.3.3 Circuit Operation 15
3.4 Project Software 16
3.4.1 Flowchart of the System 17
3.4.2 Description of Flowchart 18
3.5 Prototype Development 18
3.5.1 Mechanical Design/Product Layout 18
3.6 Sustainability Element in The Design Concept 18
3.7 Chapter Summary 19
CHAPTER 4 20
4 PROJECT MANAGEMENT AND COSTING 20
4.1 Introduction 20
4.2 Gant Chart and Activities of the Project 20
4.3 Milestone 21

4.4 Cost and Budgeting 21
4.5 Chapter Summary 22
REFERENCES **23**
5 APPENDICES **25**
APPENDIX A- DATA SHEET 26
APPENDIX B- PROGRAMMING 28
APPENDIX C- PROJECT MANUAL/PRODUCT CATALOGUE 34

LIST OF TABLES

TABLE **TITLE** **PAGE**

Table 2.1: Treatments to Improve Motor Skills in the Market 6

Table 3.1:Sequence of Finger Model Blinking ....

Table 3.2: Means and Standard Deviations (In Brackets) Of Strength Scores (In Pounds Force) For Each Hand Of Males. Right Hand. ....

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1: Block diagram of open loop and closed loop system		7
Figure 3.1: Flow chart of operation of the system		11
Figure 3.2: Circuit Diagram		12
Figure 3.3: Front view of the project		13

CHAPTER 1

INTRODUCTION

1.1 Introduction

This is a project which an electronic weighing scale that will be installed to shopping cart which the purpose to facilitate customer dealings from long queues to weigh items especially groceries which It can preserve both time and energy, the way customers need to wait for a long queue to weigh items at shopping mart cause to waste a lot of time and the risk for being in crowded especially during this pandemic.

So, to overcome the problem, I've decided to design and construct a small weighing scale machine that can weigh items specifically for groceries. This will help customer from the need to wait for a long queue and these devices are pocket-sized with easily read display screens making them easy to use, store and transport, and can even be measure items accurately for items from 0-5 kg and overload indication and automatically lock weight results. These devices are pocket-sized with easily read display screens making them easy to use and can even weigh items to a high degree of accuracy that also can display weigh of items. The only real disadvantage is that it requires a battery charge or power source to operate also can't weigh items from 5 kg and above.

1.2 Background Research

The goal of weighing is always the same: to obtain a precise quantification of the matter that makes up various objects in order to use that number to transport, record, process or use the object or matter more efficiently. From making medication to calculating the amount of fuel needed by a plane, mass and weight are integral components in a wide variety of formulas and calculations needed to improve our daily lives. Engineers need to know the weight of cars or trucks when building a bridge that will have to support them. Animal sanctuaries often have to weigh the animals in their care to make sure they're healthy and to feed them properly. Scales are very handy when measuring raw materials because their shape is often irregular, so weight can be the only way to properly assess their worth. In science, aside from pure quantification, setting weight standards for samples allows for streamlined testing procedure and simplifies applications such as formulation, mixing or assessing a sample's properties. When medicine has a recommended dosage, it's based on the average weight of the species that will be using it.

Weighing is also useful for commercial applications. From businesses buying raw materials to customers doing their grocery shopping, scales allow buyers and sellers to know exactly what they're selling and buying, and how much the things they're buying are worth. Standardized quantities make things easier and allow for quick comparisons between products. For example, if a consumer buys a can of soda, they usually get 12 ounces of liquid. When they shop, if different sodas have a different price for the same quantity (i.e., unit price), they can infer that maybe the more expensive one is made with better materials or perhaps uses fair trade ingredients. It's also easier for companies to arrange shipping and stores to create displays when they know bottles or packages will all be specific sizes. Trade-approved scales are helpful for consumer trust, essentially providing a way for people to be sure that they are getting exactly what they're paying for. That can also be useful in laboratories, where certifications or calibrations must be conducted as specified to get reliable results that can be trusted by everyone who will use these results for further analysis.

1.3 Problem Statement

Customers need to wait for a long queue to weigh items at shopping mart which cause to waste a lot of time and the risk for being in crowded especially during this pandemic. To overcome the problem, I've decided to design and construct a small weighing scale machine that can weigh items specifically for groceries. This will help customer from the need to wait for a long queue and these devices are pocket-sized with easily read display screens making them easy to use, store and transport, and can even be measure items accurately for items from 0-5 kg. The only real disadvantage is that it requires a battery charge or power source to operate also can't weigh items from 5 kg and above.

Most scales now work by using devices known as load cells to measure how much an object weighs, whether you are using it for medical, industrial, or retail purposes. A load cell is a force gauge that is made up of a transducer that is used to create an electrical signal whose magnitude is in direct proportion with the force being measured. Essentially, when any weight is placed on to a scale, the load cell bends slightly, which causes the electrical signal that runs through the load cell to change. This signal change is due to the amount of electrical resistance the bending causes to the strain gauge inside the load cell. The signal is then read by an electronic device, often a digital weight indicator, and transformed into a digital weight value. The value is then displayed for reading. Regardless of the complexity of the scale and weight indicator, all scales work in this similar way whether you're using scales at home to keep an eye on your weight, using retail scales to weigh fresh produce or using accurate medical scales.

1.4 Research Objectives

The main objective of this Project is to facilitate customer dealings from long queues to weigh items especially groceries which It can preserve both time and energy.

More specifically the principal objective of this research are:

1. To design a small machine electronic weighing scale at shopping cart that can weight items.

2. To construct a system that can display weight of items.

1.5 Scope of Research

It's a project which is a shopping cart with electronic weighing scale which the project has hardware and software category that can weigh items also can display weigh of items. This device will be installed at shopping cart to use at shopping mart with the target audience is surely for adults or we could say customers that came to buy some groceries at mart and want to weigh some of their groceries items but want to avoid the need to queue and wasting time to weigh the items which got accurate measurements on items with weigh capacity from 0-5 kg equivalent to 0 lb to 11 lb, that obviously to weight items such as fruits/vegetables.

1.6 Project Significance

The electronic weighing scale or digital weighing balance is an important item. It helps in checking a product's weight. However, without a weight machine, it's impossible to understand the precise mass of anything. The electronic weighing machines consist of the essential load cell, suitable signal conditioners, and output recorders or indicators. And that they give both the analog and digital output for further processing. The digital output of any weighing scale is much more accurate than the analog output. Scales are used to measure the weight of an item. To use a scale, the item which needs to be weighed is put on one side of the scale. Then, weight stones are put on the other side. Once the scale balances, the correct weight is chosen. There are also modern scales, where the item is simply put on the scale. Its weight can then be read from an electronic or analogue display. Weighting Scales are used to measure the weight of an item. To use a scale, the item which needs to be weighed is put on one side of the scale.

1.7 Chapter Summary

Based on this project what I got from the research that I've made is a starting point for new ideas which lead me to design and construct a small weighing scale machine that can weigh items specifically for groceries that will help customer from the need to wait for a long queue to weigh items which is called Shopping cart with electronic weighing scale, it also can preserve both time and energy, Low battery, and overload indication and automatically lock weight results. The cause of customers' needs to wait for a long queue to weigh items at shopping mart which cause to waste a lot of time and the risk for being in crowded especially during this pandemic had me come with the idea so it will help customer from the need to wait for a long queue. These devices are pocket-sized with easily read display screens making them easy to use, store and transport, and can even be measure items accurately.

CHAPTER 2

LITERATURE REVIEW

1.8 Introduction

For literature review which can be discovered by fact finding or can be done by analysis of what has already been published on a question or issue, I’ve found only two projects that use the weighing principle or related to weigh which is Digital Portable Handheld Suitcase Weight for Travel and Laser Measures. Firstly, is Digital Portable Handheld Suitcase Weight for Travel created by Etekcity store which can be found on Amazon. The objective for the project is Built for Travel that weight your luggage or bag before you go and fit the scale in pockets without adding excessive weight with thermometer temperature sensor in both F° and C° which the purpose to know your delicate luggage is in an ideal climate. The method use for this product is to avoid overweight fees: hook your suitcase for instant weight and save time before you wait in line and as the result, tare and auto-off functions included to preserve both time and energy; Low battery and overload indication; Automatically lock weight results.

Next, Laser Measures created by Leica Geosystems revolutionized measurement who creating the world’s very first handheld laser distance measurer in 1993. The main objective for this project is to laser distance meters send a laser to a particular point and then, using the time taken for this light beam to return to the device, calculates the distance to a high degree of accuracy with method that the laser measures can be used one-handed and do not require anyone to assist with longer measurements. They can also be used in low light, especially when they feature backlit LCD or digital displays. Laser measurement devices can typically record several points of references without having to move, allowing you to calculate relative distances between two points and can even be tripod-mounted for accurate measurements over very long distances.

To summaries prior research on both projects, I’ve got a lot of knowledge learnt from others and that my research is a starting point for new ideas which lead me to design and construct a small weighing scale machine that can weigh items specifically for groceries that will help customer from the need to wait for a long queue to weigh items. The familiarity I got from my project with both project I’ve made is firstly for Digital Portable Handheld Suitcase Weight for Travel, the method use for this project is to a hook item which is suitcase for instant weight and save time before you wait in line and as the result, which functions included to preserve both time and energy and automatically lock weight results. Next, Laser Measures calculates measurement with a high degree of accuracy calculate relative can even be tripod-mounted for accurate measurements over very long distances.

1.9 Shopping Cart with Electronic Weighing Scale (Literature Review Topic 1)

An electronic weighing scale for digital measurement. The objectives of the system were to read weight measured in the conventional analog form to digital form, achieve high precision in measurement and calibration. The components used for this research are Load Cell, Hx711 Load Cell amplifier, Arduino Uno Microcontroller, and an LCD Display. In this research, a 5kg load cell is used. The load cell sends output signals of the mechanical weights measured to the Hx711 module which amplifies and sends the output to the Arduino microcontroller. The microcontroller calibrates the output signal with the aid of the load cell amplifier module before sending the signal which is already converted to digital form to the LCD module for display. The system developed has proved that a digital electronic weighing system can be low cost, miniaturized, detached, and can take accurate readings devoid of errors.

1.9.1 Previous Research (Subtopic Literature Review Topic 1)

Weighing is also useful for commercial applications. From businesses buying raw materials to customers doing their grocery shopping, scales allow buyers and sellers to know exactly what they're selling and buying, and how much the things they're buying are worth. Standardized quantities make things easier and allow for quick comparisons between products. For example, if a consumer buys a can of soda, they usually get 12 ounces of liquid. When they shop, if different sodas have a different price for the same quantity (i.e., unit price), they can infer that maybe the more expensive one is made with better materials or perhaps uses fair trade ingredients. It's also easier for companies to arrange shipping and stores to create displays when they know bottles or packages will all be specific sizes. Trade-approved scales are helpful for consumer trust, essentially providing a way for people to be sure that they are getting exactly what they're paying for. That can also be useful in laboratories, where certifications or calibrations must be conducted as specified to get reliable results that can be trusted by everyone who will use these results for further analysis.

1.10 Control System (Literature Review Topic 2)

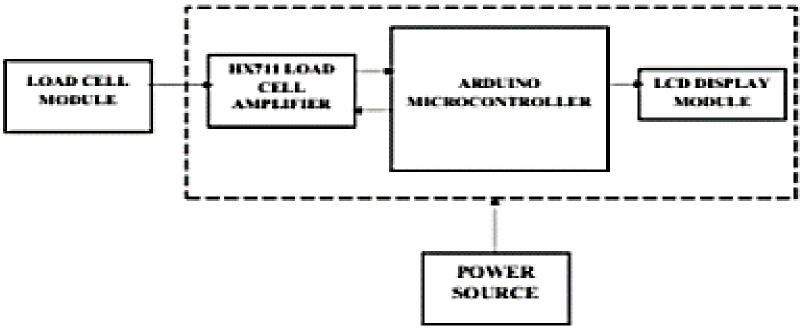


Figure 2.1: Block diagram of open loop and closed loop system

1.10.1 Arduino Uno

The Arduino uno was used control center for the project. The Arduino coding was programmed in Arduino IDE. All activities for the developed system are carried out in the Arduino uno. Arduino UNO also is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.

1.10.2 Load Cell

The load cell which is also known as a transducer converts mechanical energy (weight) to an electrical output. The magnitude of the electrical output is directly proportioned to applied force. The strain gauge in the Load cells deforms when pressure is applied on it. Strain gauge generates electrical signal during deformation because its effective resistance changes during deformation. The load cell weighs up to 5kg of load.

1.10.3 HX711

Hx711 Load cell amplifier is a 24 high precision analog to digital converter which amplifies low electric output from the load cells, amplifies and converts the low electric output of the load cell gotten from the mechanical energy (weight) and converts it to a digital form. The digital form is transmitted into the Arduino uno to generate the weight. When the load cell amplifier is connected to the microcontroller, changes in the resistance of the load cell will be read by the microcontroller with some calibrations. This causes very accurate weight measurements.

1.10.4 LCD Display

The LCD display is an electronic display module used to display the output of the scale result of the developed system. LCD is also a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

1.11 Chapter Summary

This section focusing on so many different sections which include introduction, literature review, previous research and block diagram of open loop and closed loop system. The next section is discovered about the technical part or component used which we used Arduino, Load Cell, HX711 and LCD Display.

CHAPTER 3

RESEARCH METHODOLOGY

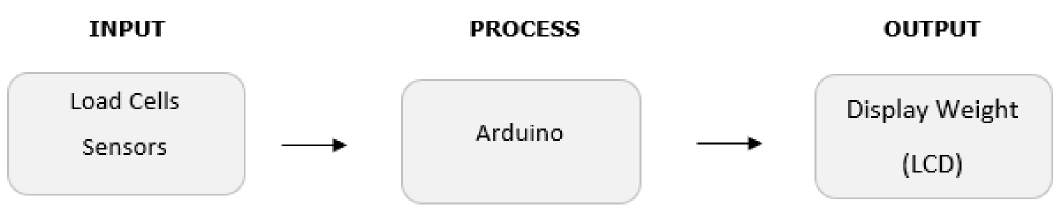
1.12 Introduction

To realize this Project as a product that ready to use with safety characteristic and also suitable to use for everyone, a very comprehensive plan is undertaking. A step-by-step procedure is done so that the Project can be completed in time. This include collecting data, design the mechanical part, circuit design testing and verification of project.

1.13 Project Design and Overview.

As mentioned in the previous chapter, the designed controller is using a closed-loop system with Arduino as the main controller. The design of the controller circuit using Arduino realizes using Proteus Software and then convert to PCB circuit.

1.13.1 Block Diagram of the Project



1.13.2 Flowchart of the Project

Figure 3.1 shows the circuit diagram of the whole system. It is showing the Shopping cart with electronic weighing scale flow chart which it starts with detect the weight of item then the weighing scale will read and then display the weight of item on LCD but if the item exceeded the weight limit, the weight of items will not be showed on LCD (ERROR).

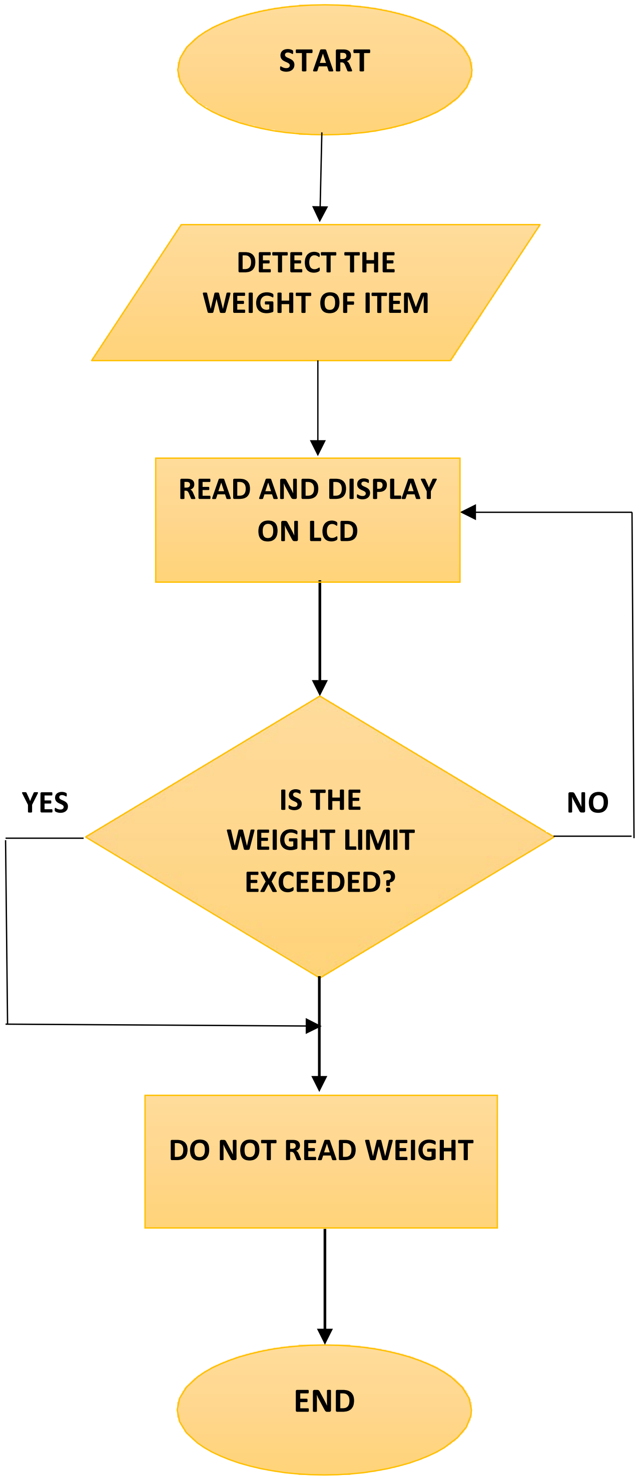


Figure 3.1: Flow chart of
operation of the system

1.13.3 Project Description

1.14 Project Hardware

As mentioned in the previous chapter, The components used for this project are Load Cell, Hx711 Load Cell amplifier, Arduino Uno Microcontroller, and an LCD module. In this research, a 5kg load cell is used. The load cell sends output signals of the mechanical weights measured to the Hx711 module which amplifies and sends the output to the Arduino microcontroller. The microcontroller calibrates the output signal with the aid of the load cell amplifier module before sending the signal which is already converted to digital form to the LCD module for display.

1.14.1 Schematic Circuit

Figure 3.2 shows the overall circuit diagram of this Project**.**

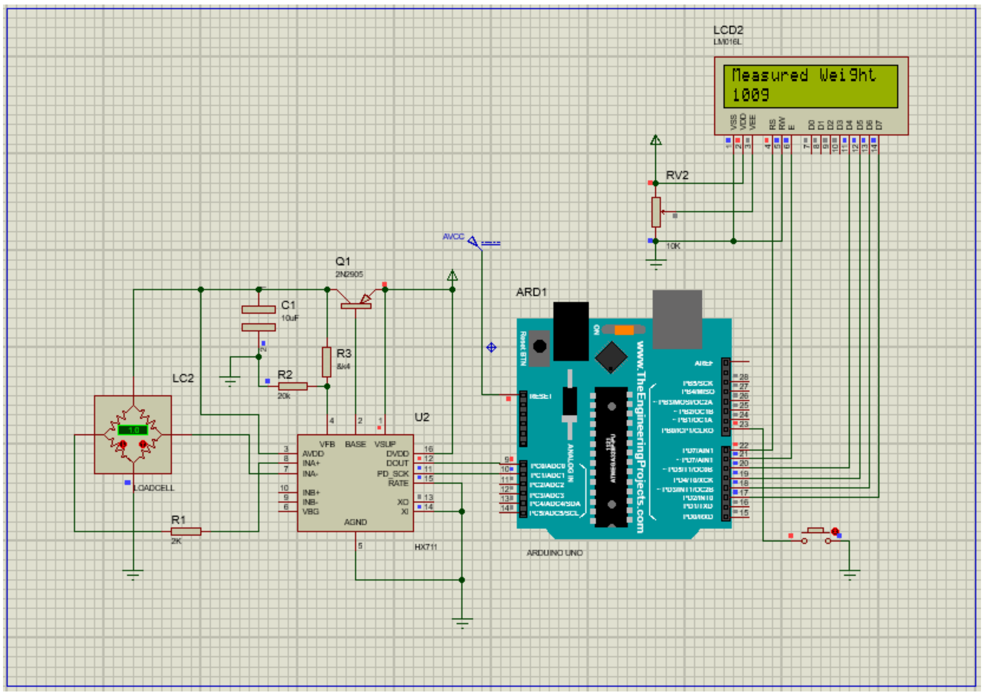
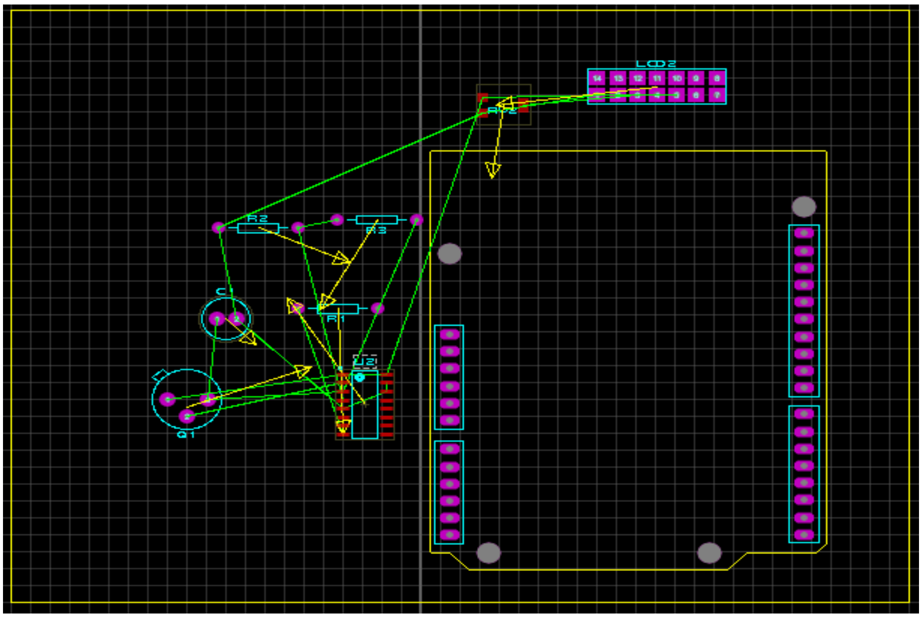


Figure3.2: Circuit Diagram

*Images may be subject to copyright



1.14.2 Description of Main Component

The components used for this research are Load Cell, Hx711 Load Cell amplifier, Arduino Uno Microcontroller, and an LCD Display. In this research, a 5kg load cell is used. The load cell sends output signals of the mechanical weights measured to the Hx711 module which amplifies and sends the output to the Arduino microcontroller. The microcontroller calibrates the output signal with the aid of the load cell amplifier module before sending the signal which is already converted to digital form to the LCD module for display.

1.14.2.1 Component 1

Arduino Uno

The Arduino uno was used control center for the project. The Arduino coding was programmed in Arduino IDE. All activities for the developed system are carried out in the Arduino uno. Arduino UNO also is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.

1.14.2.2 Component 2

Load Cell

The load cell which is also known as a transducer converts mechanical energy (weight) to an electrical output. The magnitude of the electrical output is directly proportioned to applied force. The strain gauge in the Load cells deforms when pressure is applied on it. Strain gauge generates electrical signal during deformation because its effective resistance changes during deformation. The load cell weighs up to 5kg of load.

1.14.2.3 Component 3

HX711

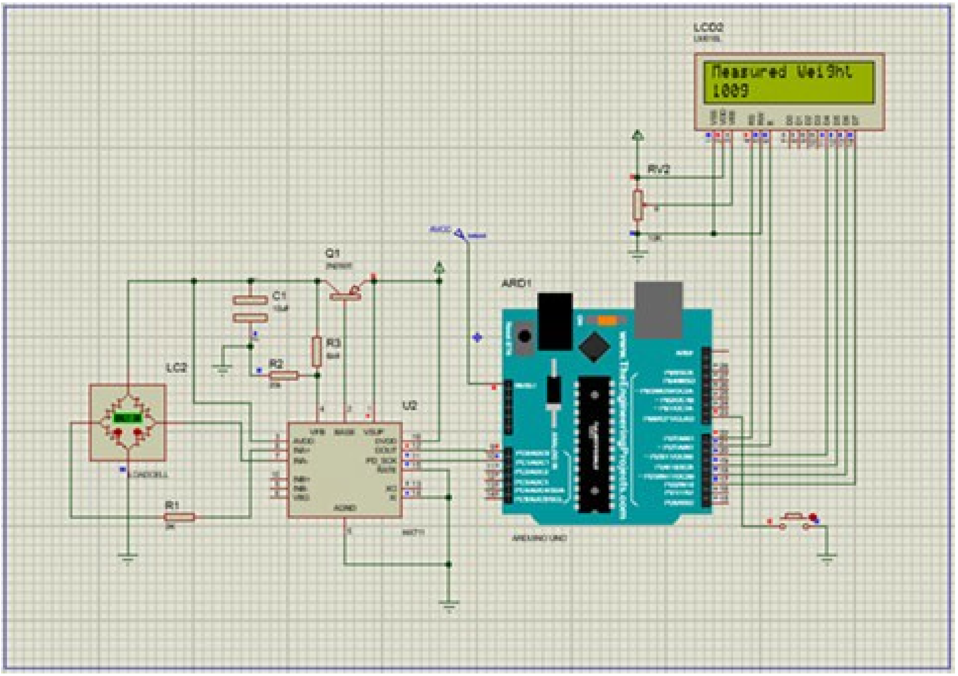
Hx711 Load cell amplifier is a 24 high precision analog to digital converter which amplifies low electric output from the load cells, amplifies and converts the low electric output of the load cell gotten from the mechanical energy (weight) and converts it to a digital form. The digital form is transmitted into the Arduino uno to generate the weight. When the load cell amplifier is connected to the microcontroller, changes in the resistance of the load cell will be read by the microcontroller with some calibrations. This causes very accurate weight measurements.

1.14.2.4 Component 4

LCD Display

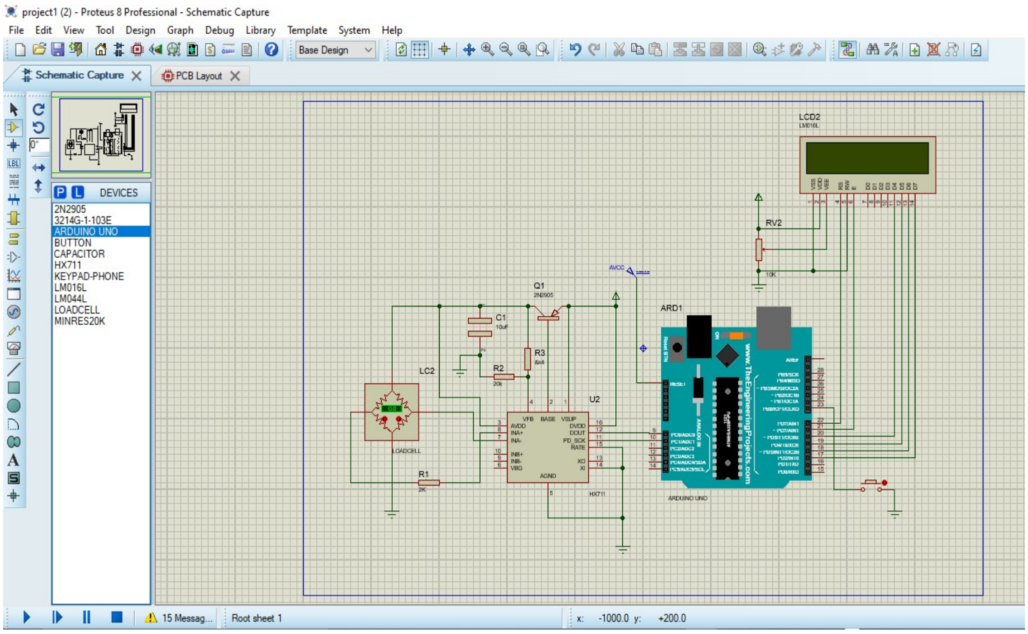
The LCD display is an electronic display module used to display the output of the scale result of the developed system. LCD is also a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

1.14.3 Circuit Operation

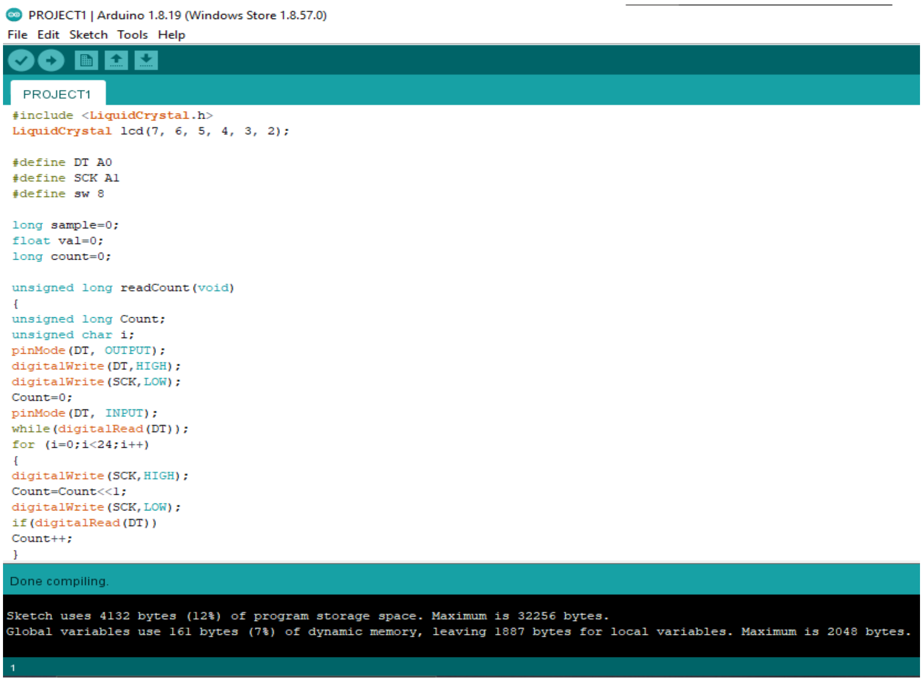


1.15 Project Software

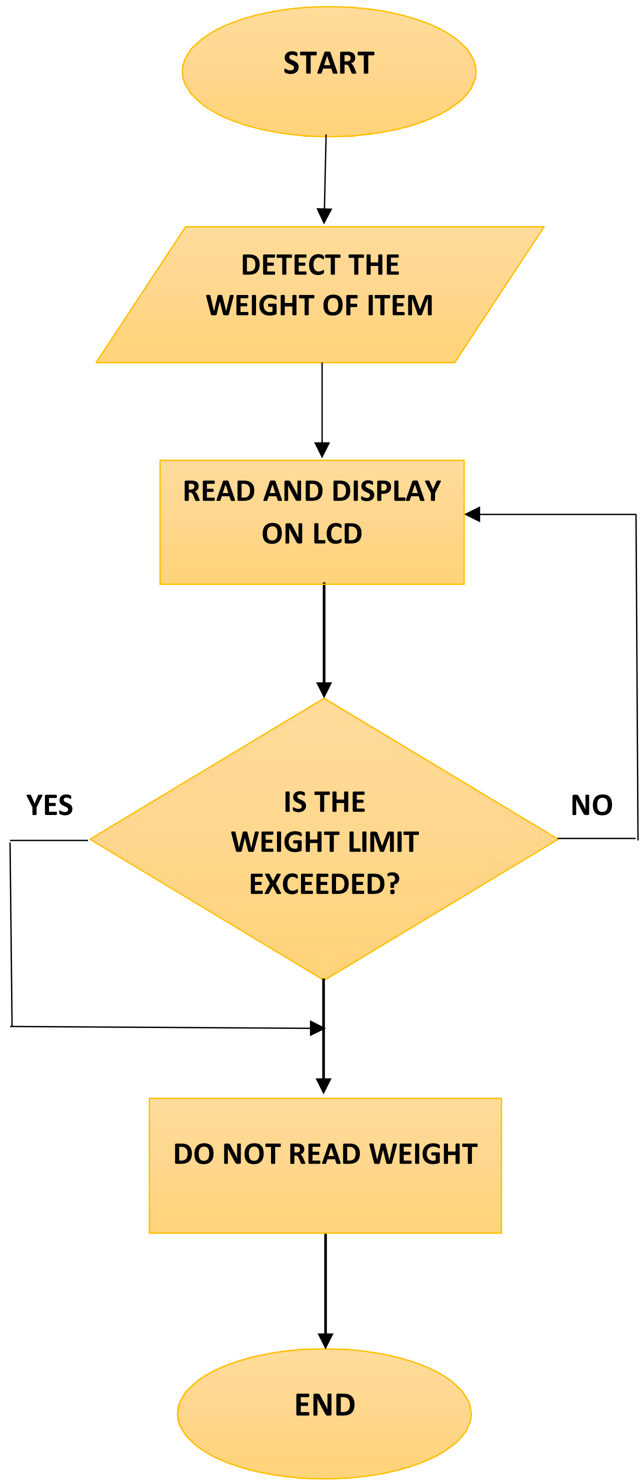
- Proteus 8 Professional Software



- Arduino IDE Software



1.15.1 Flowchart of the System



1.15.2 Description of Flowchart

The flowchart above showed of the whole system. It is showing the Shopping cart with electronic weighing scale flow chart which it starts with detect the weight of item then the weighing scale will read and then display the weight of item on LCD but if the item exceeded the weight limit, the weight of items will not be showed on LCD (ERROR).

1.16 Prototype Development

1.16.1 Mechanical Design/Product Layout

Figure 3.3 shows the design of the product which is electronic weighing scale that will be installed to shopping cart.

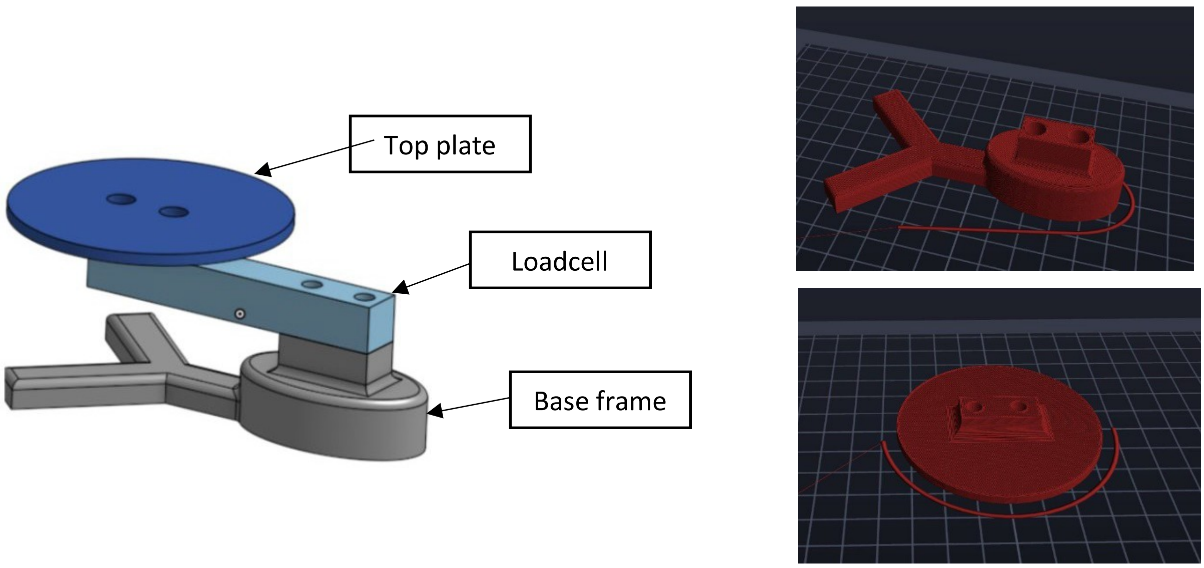


Figure 3.3: Front view of the Project

1.17 Chapter Summary

This section focusing on so many different sections which include Introduction, Project design and overview, Block Diagram of the Project, Flowchart of the Project and also description of the flowchart, Project description and Description of Main Component, Schematic circuit of project and software used for this project, and lastly Mechanical Design/Product Layout which is the early sketch of project.

CHAPTER 4

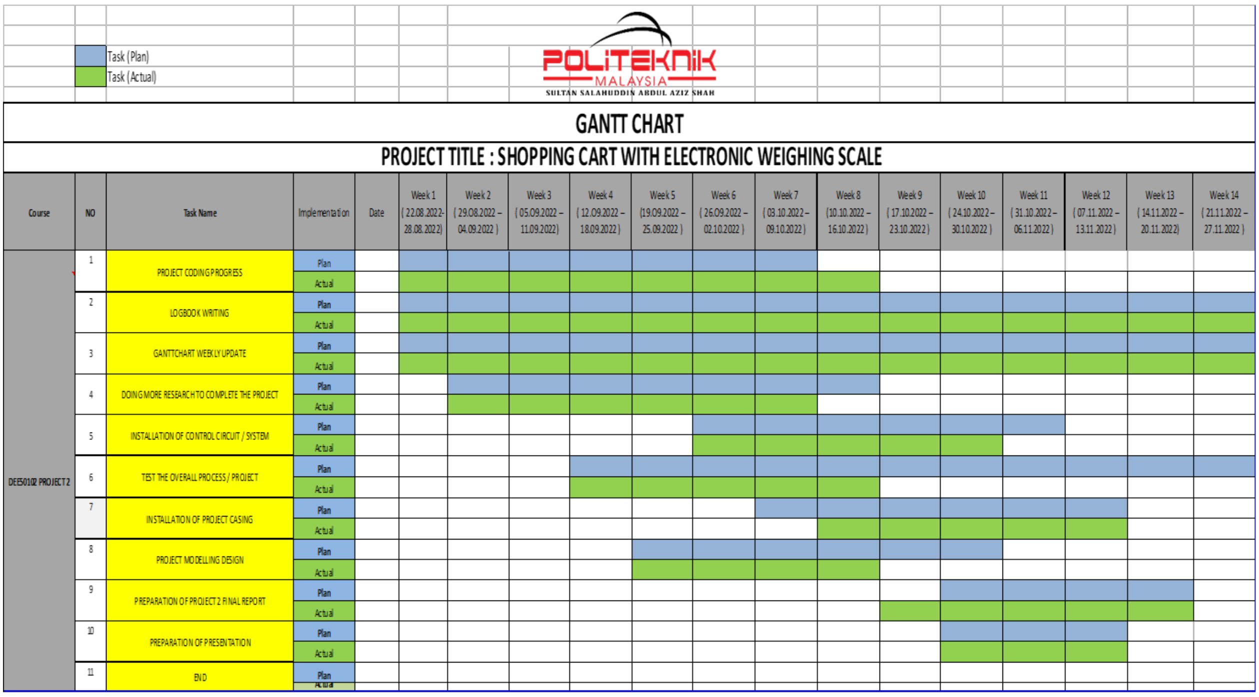
PROJECT MANAGEMENT AND COSTING

1.18 Introduction

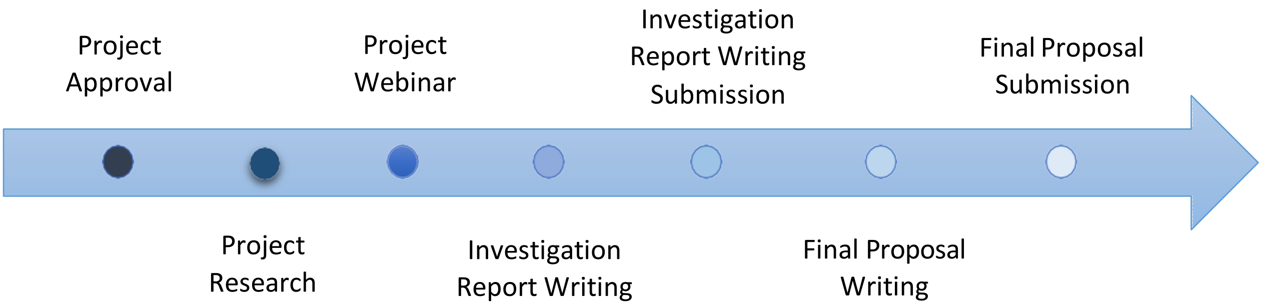
This project involves the cost of purchasing components and materials throughout its implementation. components involving cost are hardware Arduino UNO, LOAD cell HX711 reader module, Force sensor, LCD Display screen, LOAD cell (0-5) KG, Push button switch, breadboard, Wire. All of these components are purchased through online purchase methods to make it easier as well as save on costs.

The overall gross budget estimate in the implementation of this project is RM 222.15 and other expenses is at RM 122.50 as shown in Table 1 According to this budget cost, this project can be considered as a less costly project compared to other projects that can cost over a thousand ringgit. The cost of the project is also in line with one of the key features of a good project developer that is low cost but have a high-quality project.

1.19 Gant Chart and Activities of the Project



1.20 Milestone



1.21 Cost and Budgeting

No.	Component and materials	The unit price	Quantity	Total
1	Arduino UNO set	RM 39.90	1	RM 39.90
2	HX711 reader module	RM 4.90	1	RM 4.90
3	Force sensor	RM 23.90	1	RM 23.90
4	LCD Display screen	RM 8.50	1	RM 8.50
5	LOAD cell (0-5 KG)	RM 7.90	1	RM 7.90
6	Push button switch	RM 0.40	2	RM 0.80
7	Breadboard	RM 3.75	1	RM 3.75
8	Wire	RM 10.00	1	RM 10.00
			Total:	**RM 99.65**
	List of other costing			
1	Transportation			
2	Postage	RM 4.50	5	RM 22.50
3	Craft Work			RM 100.00
4	Internet			
5	Application			
			Total:	**RM 122.50**
			Overall total	**RM 222.15**

1.22 Chapter Summary

This section which is chapter 4 are focusing on project management and costing and also many different sections which include Introduction, Gant Chart and Activities of the Project, Milestone doing the project and lastly the table of project cost and budgeting.

CHAPTER 5

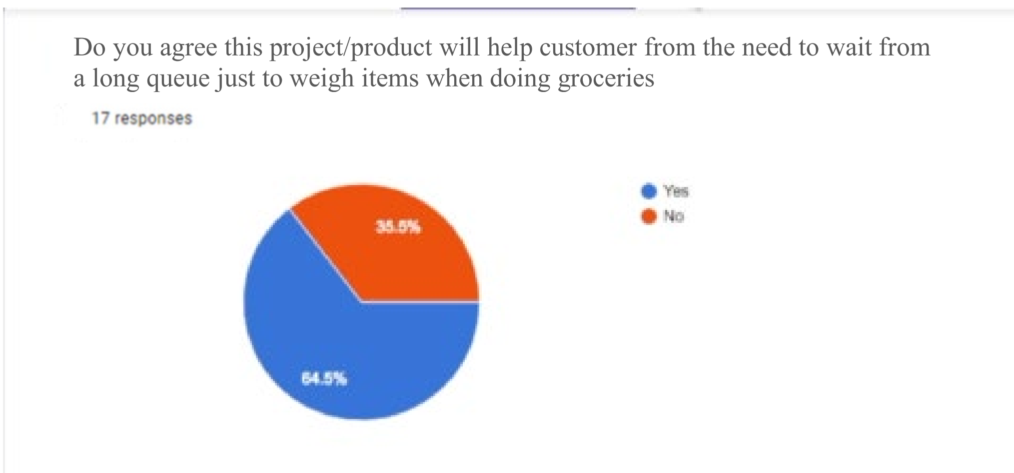
CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter is going to include discussion and recommendation of respondents/people thoughts about this project. Recommendations and feedback are gained from the same survey where they must write any thoughts. Section also going to be related about literature review from past chapter. Suggestion from future work is fully obtained from respondents.

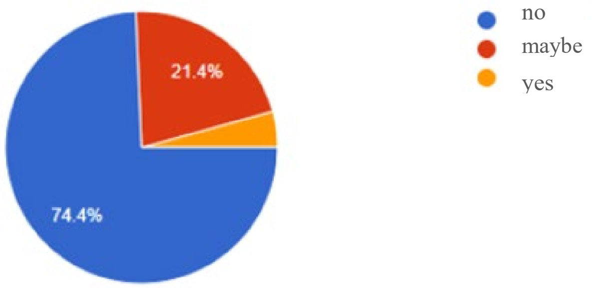
5.2 Conclusion

Here are some of the questions that respondents/people mostly agreed and can lead this project or product to become a successful yet help customer from the need to wait from a long queue just to weigh items when doing groceries as well as help preserve both time and energy.



Do you think they'll be other project/product that will help customer preserve customer both time and energy to weigh items when doing groceries in future?

17 responses



From the response we can conclude that everyone gives a positive also good response regarding about my project/product which is Shopping cart with electronic weighing scale. and also thinks it is a very good ideas to have this and put it at the supermarket to help ease more the customer to weigh their groceries items which they don't need to queue just to weigh items when doing groceries as well as help preserve both time and energy of every customer.

5.3 Suggestion for Future Work

Suggestions for the future in order to make this project more successful or ideal, as it is intended to be. Upgrade the project/product to make it more competent and capable of acting appropriately than it is now. Among the ideas that I obtained and proposed for the future is to add the price sticker tag and camera item detection. For the price tag sticker, it is said that that it would be more help for customer which they don't need to go the groceries counter just to weigh the item again to get the price tag sticker of the items they want to weigh. while for the camera item detection, it is said that it would be a good innovation as it will help for the item's detection through camera and send the information obtained which what item the camera detects to the project system then proceed to the price tag sticker system to produce the price tag sticker based on the items name, weight and price.

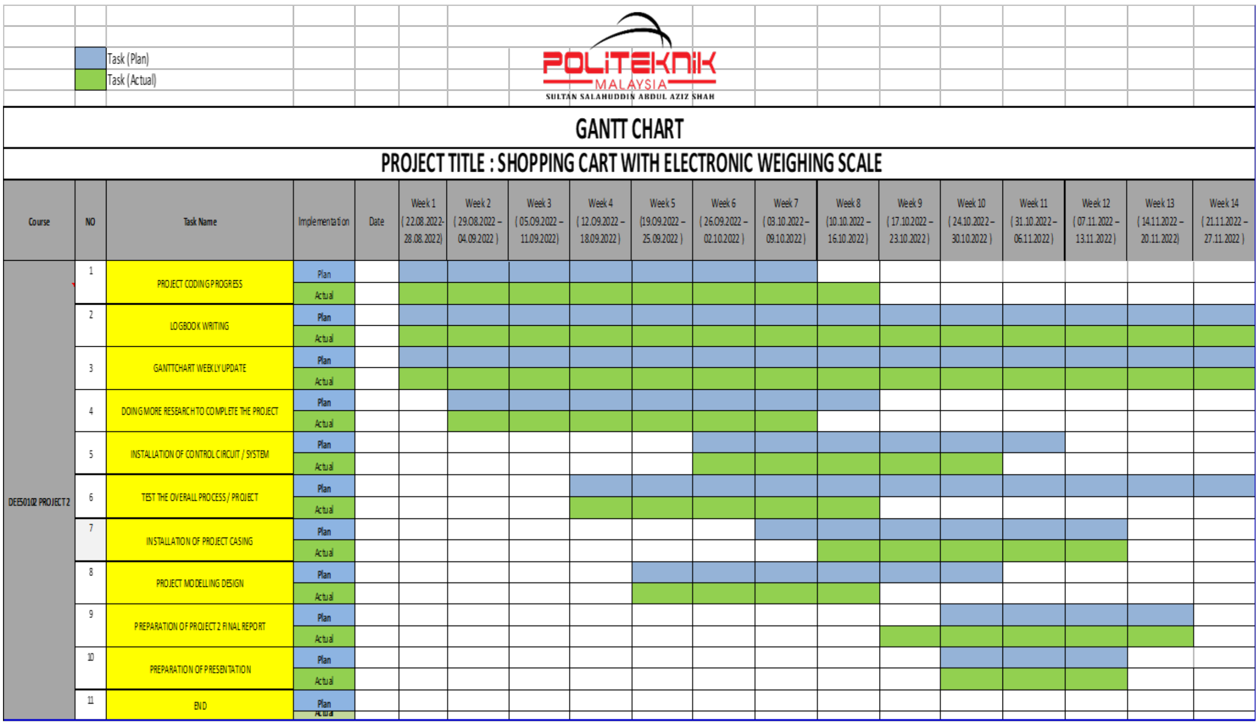
CHAPTER 6

PROJECT MANAGEMENT AND COSTING

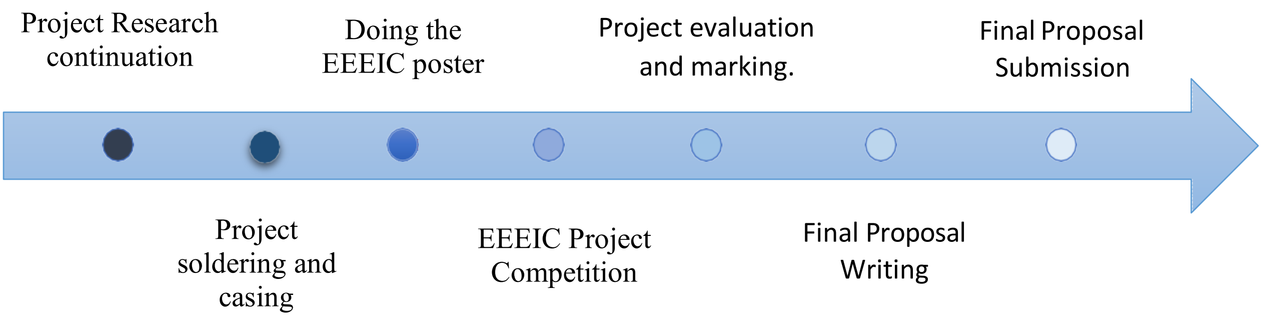
6.1 Introduction

This project involves the cost of purchasing components and materials throughout its implementation. components involving cost are hardware Arduino UNO, LOAD cell HX711 reader module, Force sensor, LCD Display screen, LOAD cell (0-5) KG, Push button switch, breadboard, Wire. All of these components are purchased through online purchase methods to make it easier as well as save on costs. The overall gross budget estimate in the implementation of this project is RM272.70 and other expenses is at RM 131.80 as shown in Table 1 According to this budget cost, this project can be considered as a less costly project compared to other projects that can cost over a thousand ringgits. The cost of the project is also in line with one of the key features of a good project developer that is low cost but have a high-quality project.

6.2 Gant Chart and Activities of the Project



6.3 Milestone



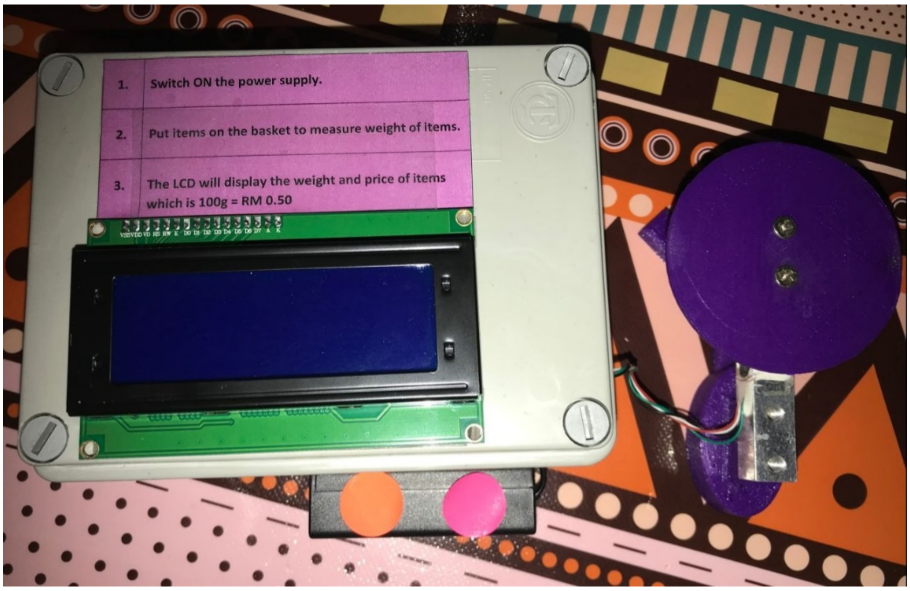
6.4 Cost and Budgeting

No.	Component and materials	The unit price	Quantity	Total
1	Arduino UNO set	RM 39.90	1	RM 39.90
2	HX711 reader module	RM 4.90	1	RM 4.90
3	Force sensor	RM 24.00	1	RM 24.00
4	LCD Display screen	RM 23.90	1	RM 23.90
5	LOAD cell (0-5 KG)	RM 7.90	1	RM 7.90
6	Push button switch	RM 0.40	4	RM 1.60
7	Breadboard	RM 3.75	1	RM 3.75
8	Wire	RM 12.00	1	RM 12.00
9	Straight pin header	RM 8.25	1	RM 8.25
10	Soldering PCB board	RM 4.90	3	RM 14.70
			Total:	**RM 140.90**
	List of other costing			
1	Postage	RM 4.50	7	RM 31.50
2	Project base & frame 3D printing	RM 80.00		RM 80.00
3	Project body casing	RM 4.50	1	RM 20.30
4	Application			
			Total:	**RM 131.80**
			Overall total	**RM 272.70**

6.5 Final look of the Project 2 (Dee50102)

Final Project Testing

Project with labelling & SOP



6.6 Chapter Summary

Chapter 6 explains about planner and Gantt Chart during completing the project from scratch to the end. Also include the Milestone with images attach for better understanding and proof of the completion. The completion update time-to-time is shown together with final product look. Cost and budget calculated above are based on table shown above or purchasing proof that is available inside my Logbook. Actual budget maybe differs from the calculated above depend on market price, availability and demand form every component for Rider Emergency Assistant device. This section which is chapter 6 are focusing on project management and costing and also many different sections which include Introduction, Gant Chart and Activities of the Project, Milestone doing the project and lastly the table of project cost and budgeting.

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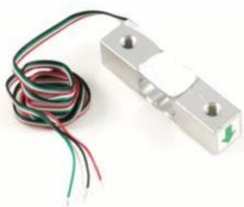
APPENDIX A- DATA SHEET

Datasheet

3133 - Micro Load Cell (0-5kg) - CZL635



Contents

1 What do you have to know?
1 How does it work - For curious people
1 Installation
2 Calibration
2 Product Specifications
3 Glossary

What do you have to know?

A load cell is a force sensing module - a carefully designed metal structure, with small elements called strain gauges mounted in precise locations on the structure. Load cells are designed to measure a specific force, and ignore other forces being applied. The electrical signal output by the load cell is very small and requires specialized amplification. Fortunately, **the 1046 PhidgetBridge will perform all the amplification and measurement of the electrical output.**

Load cells are designed to measure force in one direction. They will often measure force in other directions, but the sensor sensitivity will be different, since parts of the load cell operating under compression are now in tension, and vice versa.

How does it work - For curious people

Strain-gauge load cells convert the load acting on them into electrical signals. The measuring is done with very small resistor patterns called strain gauges - effectively small, flexible circuit boards. The gauges are bonded onto a beam or structural member that deforms when weight is applied, in turn deforming the strain-gauge. As the strain gauge is deformed, it's electrical resistance changes in proportion to the load.

The changes to the circuit caused by force is much smaller than the changes caused by variation in temperature. Higher quality load cells cancel out the effects of temperature using two techniques. By matching the expansion rate of the strain gauge to the expansion rate of the metal it's mounted on, undue strain on the gauges can be avoided as the load cell warms up and cools down. The most important method of temperature compensation involves using multiple strain gauges, which all respond to the change in temperature with the same change in resistance. Some load cell designs use gauges which are never subjected to any force, but only serve to counterbalance the temperature effects on the gauges that measuring force. Most designs use 4 strain gauges, some in compression, some under tension, which maximizes the sensitivity of the load cell, and automatically cancels the effect of temperature.

Installation

This Single Point Load Cell is used in small jewelry scales and kitchen scales. It's mounted by bolting down the end of the load cell where the wires are attached, and applying force on the other end **in the direction of the arrow.** Where the force is applied is not critical, as this load cell measures a shearing effect on the beam, not the bending of the beam. If you mount a small platform on the load cell, as would be done in a small scale, this load cell provides accurate readings regardless of the position of the load on the platform.

24-Bit Analog-to-Digital Converter (ADC) for Weigh Scales

DESCRIPTION

Based on Avia Semiconductor's patented technology, HX711 is a precision 24-bit analog-to-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor.

The input multiplexer selects either Channel A or B differential input to the low-noise programmable gain amplifier (PGA). Channel A can be programmed with a gain of 128 or 64, corresponding to a full-scale differential input voltage of ±20mV or ±40mV respectively, when a 5V supply is connected to AVDD analog power supply pin. Channel B has a fixed gain of 32. On-chip power supply regulator eliminates the need for an external supply regulator to provide analog power for the ADC and the sensor. Clock input is flexible. It can be from an external clock source, a crystal, or the on-chip oscillator that does not require any external component. On-chip power-on-reset circuitry simplifies digital interface initialization.

There is no programming needed for the internal registers. All controls to the HX711 are through the pins.

FEATURES

- **Two selectable differential input channels**
- **On-chip active low noise PGA with selectable gain of 32, 64 and 128**
- **On-chip power supply regulator for load-cell and ADC analog power supply**
- **On-chip oscillator requiring no external component with optional external crystal**
- **On-chip power-on-reset**
- **Simple digital control and serial interface: pin-driven controls, no programming needed**
- **Selectable 10SPS or 80SPS output data rate**
- **Simultaneous 50 and 60Hz supply rejection**
- **Current consumption including on-chip analog power supply regulator:**
  normal operation < 1.5mA, power down < 1uA
- **Operation supply voltage range: 2.6 ~ 5.5V**
- **Operation temperature range: -40 ~ +85℃**
- **16 pin SOP-16 package**

APPLICATIONS

- **Weigh Scales**
- **Industrial Process Control**

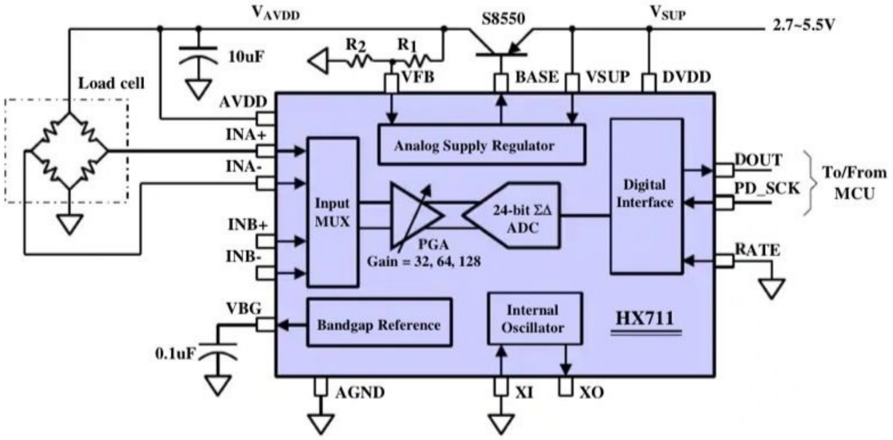


Fig. 1 Typical weigh scale application block diagram

APPENDIX B- PROGRAMMING

NEW_PROJECT2_CODING | Arduino 1.8.19 (Windows Store 1.8.57.0)

File Edit Sketch Tools Help

NEW_PROJECT2_CODING

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

#define DT A0
#define SCK A1
#define sw 8

long sample=0;
float val=0;
long count=0;
float price = 0.0;

unsigned long readCount(void)
{
unsigned long Count;
unsigned char i;
pinMode(DT, OUTPUT);
digitalWrite(DT,HIGH);
digitalWrite(SCK,LOW);
Count=0;
pinMode(DT, INPUT);
while(digitalRead(DT));
for (i=0;i<24;i++)
{
digitalWrite(SCK,HIGH);
Count=Count<<1;
digitalWrite(SCK,LOW);
if(digitalRead(DT))
Count++;
}
digitalWrite(SCK,HIGH);
Count=Count^0x800000;
digitalWrite(SCK,LOW);
return(Count);
}

void setup()
{
pinMode(SCK, OUTPUT);
pinMode(sw, INPUT_PULLUP);
lcd.begin(20, 4);
lcd.print(" Weight ");
lcd.setCursor(0,1);
lcd.print(" Measurement ");
delay(1000);
lcd.clear();
calibrate();
}

void loop()
{
count= readCount();
int w=(((count-sample)/val)-2*((count-sample)/val));
lcd.setCursor(0,0);
lcd.print("Measured Weight");
lcd.setCursor(0,1);
lcd.print(w);
lcd.print("g ");
```

```
//Calculating price

if(w == 0){
  price = 0.0;
}
else if(w > 1 && w <= 100){
  price = 0.5;
}
else if(w > 100 && w <= 200){
  price = 1.0;
}
else if(w > 200 && w <= 300){
  price = 1.5;
}
else if(w > 300 && w <= 400){
  price = 2.0;
}
else if(w > 400 && w <= 500){
  price = 2.5;
}
else if(w > 500 && w <= 600){
  price = 3.0;
}
else if(w > 600 && w <= 700){
  price = 3.5;
}
else if(w > 700 && w <= 800){
  price = 4.0;
```

```
}
else if(w > 800 && w <= 900){
  price = 4.5;
}
else if(w > 900 && w <= 1000){
  price = 5.0;
}
else if(w > 1000 && w <= 1100){
  price = 5.5;
}
else if(w > 1100 && w <= 1200){
  price = 6.0;
}
else if(w > 1200 && w <= 1300){
  price = 6.5;
}
else if(w > 1300 && w <= 1400){
  price = 7.0;
}
else if(w > 1400 && w <= 1500){
  price = 7.5;
}
else if(w > 1500 && w <= 1600){
  price = 8.0;
}
else if(w > 1600 && w <= 1700){
  price = 8.5;
}
else if(w > 1700 && w <= 1800){
```

```
else if(w > 1800 && w <= 1900){
  price = 9.5;
}
else if(w > 1900){
  price = 10.0;
}
/*
lcd.setCursor(0,2);
lcd.print("Price");
lcd.setCursor(0,3);
lcd.print("RM");
lcd.print(price);
*/
lcd.setCursor(0,3);
lcd.print("Price:RM");
lcd.print(price);

if(digitalRead(sw)==0)
{
val=0;
sample=0;
w=0;
count=0;
calibrate();
}
}

void calibrate()
{
lcd.print("Calibrating...");
lcd.setCursor(0,1);
lcd.print("Please Wait...");
for(int i=0;i<100;i++)
{
count=readCount();
sample+=count;
}
sample/=100;
lcd.clear();
lcd.print("Put 100g weight");
count=0;
while(count<1000)
{
count=readCount();
count=sample-count;
}
lcd.clear();
lcd.print("Please Wait....");
delay(2000);
for(int i=0;i<100;i++)
{
count=readCount();
val+=sample-count;
}
val=val/100.0;
val=val/100.0; // put here your calibrating weight
lcd.clear();
}
```

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

#define DT A0
#define SCK A1
#define sw 8

long sample=0;
float val=0;
long count=0;
float price = 0.0;

unsigned long readCount(void)
{
unsigned long Count;
unsigned char i;
pinMode(DT, OUTPUT);
digitalWrite(DT,HIGH);
digitalWrite(SCK,LOW);
Count=0;
pinMode(DT, INPUT);
while(digitalRead(DT));
for (i=0;i<24;i++)
{
digitalWrite(SCK,HIGH);
Count=Count<<1;
digitalWrite(SCK,LOW);
if(digitalRead(DT))
Count++;
}
digitalWrite(SCK,HIGH);
Count=Count^0x800000;
digitalWrite(SCK,LOW);
return(Count);
}

void setup()
{
pinMode(SCK, OUTPUT);
pinMode(sw, INPUT_PULLUP);
lcd.begin(20, 4);
lcd.print(" Weight ");
lcd.setCursor(0,1);
lcd.print(" Measurement ");
delay(1000);
lcd.clear();
calibrate();
}

void loop()
```

```
{
count= readCount();
int w=(((count-sample)/val)-2*((count-sample)/val));
lcd.setCursor(0,0);
lcd.print("Measured Weight");
lcd.setCursor(0,1);
lcd.print(w);
lcd.print("g ");

//Calculating price

if(w == 0){
  price = 0.0;
}
else if(w > 1 && w <= 100){
  price = 0.5;
}
else if(w > 100 && w <= 200){
  price = 1.0;
}
else if(w > 200 && w <= 300){
  price = 1.5;
}
else if(w > 300 && w <= 400){
  price = 2.0;
}
else if(w > 400 && w <= 500){
  price = 2.5;
}
else if(w > 500 && w <= 600){
  price = 3.0;
}
else if(w > 600 && w <= 700){
  price = 3.5;
}
else if(w > 700 && w <= 800){
  price = 4.0;
}
else if(w > 800 && w <= 900){
  price = 4.5;
}
else if(w > 900 && w <= 1000){
  price = 5.0;
}
else if(w > 1000 && w <= 1100){
  price = 5.5;
}
else if(w > 1100 && w <= 1200){
  price = 6.0;
}
```

```
else if(w > 1200 && w <= 1300){
  price = 6.5;
}
else if(w > 1300 && w <= 1400){
  price = 7.0;
}
else if(w > 1400 && w <= 1500){
  price = 7.5;
}
else if(w > 1500 && w <= 1600){
  price = 8.0;
}
else if(w > 1600 && w <= 1700){
  price = 8.5;
}
else if(w > 1700 && w <= 1800){
  price = 9.0;
}
else if(w > 1800 && w <= 1900){
  price = 9.5;
}
else if(w > 1900){
  price = 10.0;
}
/*
lcd.setCursor(0,2);
lcd.print("Price");
lcd.setCursor(0,3);
lcd.print("RM");
lcd.print(price);
*/
lcd.setCursor(0,3);
lcd.print("Price:RM");
lcd.print(price);

if(digitalRead(sw)==0)
{
val=0;
sample=0;
w=0;
count=0;
calibrate();
}
}

void calibrate()
{
lcd.clear();
lcd.print("Calibrating...");
lcd.setCursor(0,1);
```

```
lcd.print("Please Wait...");
for(int i=0;i<100;i++)
{
count=readCount();
sample+=count;
}
sample/=100;
lcd.clear();
lcd.print("Put 100g weight");
count=0;
while(count<1000)
{
count=readCount();
count=sample-count;
}
lcd.clear();
lcd.print("Please Wait....");
delay(2000);
for(int i=0;i<100;i++)
{
count=readCount();
val+=sample-count;
}
val=val/100.0;
val=val/100.0; // put here your calibrating weight
lcd.clear();
}
```

APPENDIX C- PROJECT MANUAL/PRODUCT CATALOGUE

1) Firstly, Switch ON the power supply

2) Wait for electronic weighing scale to calibrating

3) Put items in the basket to measure weight of items

4) Wit for LCD to processing and show the item weight

5) The LCD will display the measured weight of item and price of items which 100g = RM 0.50