BASIC ELECTRONIC TRAINER

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ABSTRACT

''*Basic Electricity Trai*ner" is a project that has been designed to enable students to learn and understand the concept of the Kirchoff current law. Trainer is also produced to help students use to integrate knowledge and skills in performing the task. Follow this Trainer it is a kit for students learn and more know how to calculate the current in each resistor and also the voltage drop. The method that we use is the circuit that being used for this project be modified to obtain the desired output, This battery 9v is giving supply voltage on it. Moreover the output 9v was being use on 2 Project for make a Kirchoff current circuit. The circuit were added by meter, and switch to make sure student get the easily trainer that they will able to understand the Basic of Kirchoff Law. The Analysis that this trainer uses is After each part of the circuit is functioning as intended.Circuits can be combined to complete the circuit operating properly. Combination of circuit testing is performed to ensure that the whole circuit has been incorporated to operate properly. This is important so that it has a relationship to complement system used. The system will work when the connection between the circuit receives a power to operate.After having problem when do the Project in Kirchoff circuit were teach a lot about how to make a project in last semester and preparation for this semester in Project EE601.For this semester, One circuit had been done successfully basic electricity circuit for series and parallel circuit. In this Project 2, the Basic Electrical Trainer by using battery as a supply voltage 9v to the Kirchoff circuit that were appear a switch ,led light and meter on it. The main reason of this success was done already and it will be big success if it is continued until this project succefully. In this Project all the things that already learn in the Industrial Training, were applying on this Project.

ABSTRAK

'Basic Electricity Trainer" ialah satu projek yang telah direka bentuk untuk membolehkan pelajar belajar dan faham konsep undang-undang semasa *Kirchoff.* T*rainer* juga dihasilkan untuk membantu pelajar untuk menyepadukan pengetahuan dan kemahiran dalam melaksanakan tugas. *Trainer* ini ia satu kelengkapan kepada pelajar belajar dan lebih banyak tahu bagaimana untuk menghitung yang semasa di setiap perintang dan juga susutan voltan. Kaedah yang kami guna ialah litar yang digunakan untuk projek ini diubah suai memperoleh keluaran yang diingini, bateri 9v memberi voltan bekalan di atasnya.Tambahan pula output 9v gunakan keatas 2 Project untuk membuat litar arus Kirchoff. Litar telah ditambah oleh meter ,dan suis bagi pastikan pelajar mendapat yang dengan mudah jurulatih yang mereka akan berkeupayaan memahami *Basic of Kirchoff Law*. Analisi yang trainer ini menggunakan ialah pada setiap bahagian litar ialah fungsi seperti dimaksudkan. Litar boleh digabungkan untuk menyiapkan litar beroperasi dengan betul. Gabungan pengujian litar dijalankan untuk memastikan bahawa litar keseluruhan telah diperbadankan untuk beroperasi dengan betul. Ini penting supaya ia mempunyai satu perhubungan kepada sistem komplemen digunakan. Sistem akan bekerja apabila sambungan antara litar menerima satu kuasa beroperasi. Setelah masalah apabila buat Projek *Kirchoff* litar banyak mengajar tentang bagaimana untuk membuat satu projek dalam semester lepas dan persediaan untuk semester ini di Project EE601. Semester ini, litar satu telah dilakukan litar bekalan elektrik yang dengan jayanya asas untuk siri dan litar selari. Dalam Project 2 ini, *Basic Electrical Trainer* dengan menggunakan bateri sebagai satu voltan bekalan 9v kepada litar Kirchoff yang kelihatan satu pertukaran, led cahaya dan meter di atasnya.

APPRECIATION

Thankful we to God existence because with the permission can we complete our last project namely "Basic Electricty Trainer" and consequently final project report. We face a little complexity and challenge in process to complete this project. Alhamdulillah help benefit of many parties can we complete project entrusted in fixed-term. As high as high appreciation to our project supervisor namely Azlina Binti Abdul Aziz's Madame because already help a lot in give coaching to complete this project. Deepest gratitude also to polytechnic lecturer across gybe that took pains give inducement and guidance throughout the duration complete our last project.

Apart from that, gratitude also is expressed to my parent above encouragement, support and help given to me in various forms including financial assistance that I need during this last project implementation. Thank you also to comrades that helped a lot and share information during process complete this report. Without their help is difficult for me complete this report.

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CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION OF PROJECT

Through the modernization that has grown rapidly all existing facilities should be used to facilitate maximum work day. In the era of globalization, many individuals are conscious or concerned with the application of technology in everyday life regardless of sector, industry, education, or from sector jobs and organizations.

Therefore, PROJECT (EE601) is one of the subjects in the electronic communication course, it is one of the conditions that must be taken for Diploma students. For this project, students need to produce one (1) circuit trainer related to diploma course taken. That for this Basic Electrical Trainer made for. For this semester, one circuit will produce it is current law series parallel.

For this basic electrical trainer it uses to do supply from battery 9 voltage for supply voltage to the Kirchoff circuit. This trainer aims to facilitate, to student to learn and understand the optical basic electricity in Kirchoff Law. In the polytechnic, all know that the basic is important, so from this project itself can teach student the formula of Kirchoff, because this formula will also being use until last semester.

This project able to being use because it about Kirchoff law parallel and series circuit. From this project, student in semester 1 will able to understand more about electronic basic of Kirchoff. This Basic Electricity Trainer will being a guide for student to know how to calculate the current and voltage by using the am/volt meter and LED light to appear in the box.

This component already being added in EE601 this semester for Project 2. This Kirchoff circuit will give student more knowledge about how to calculate current and voltage in the same time they also be able to use it anytime because it easily use.

1.1 OBJECTIVE

a) Produce a trainer that can allow student to apply the formula in Kirchoff Law.
b) Student able to understand and easy practice about basic Kirchoff current and voltage law in parallel circuit.
c) Able to calculate current and voltage drop.

1.2 PROBLEM STATEMENT

This Project aims to facilitate and give to student to learn and understand the optical basic electricity in Kirchoff Law. In the polytechnic this basic is important, so from this project it can teach students semester one about formula of Kirchoff, because this formula will also being use until last semester.

This project able to encourage student to self studies and apply this performance of trainer kit in this project. Therefore this project, will encourage student understand more about electronic basic when they use this trainer

1.3 PROJECT SCOPE

The project scopes for this project will focus on the Kirchoff current and voltage Law circuit. The source used for Basic Electrical Trainer is battery 9v in Kirchoff circuit need be done well for this semester.

This project will focus on the semester 1 student diploma. Because this basic electricity in Kirchoff law will being use until last semester. So they able to practice how to calculate the Kirchoff current and voltage Law.

This project also will encourage the student to self studies with the trainer and easily learn Kirchoff formula.

CHAPTER 2

LITERATURE RESEARCH

2.0 Kirchoff Law Theory

a) Kirchoff Current & Voltage Law

We saw in the resistors tutorial that a single equivalent resistance, (r_t) can be found when two or more resistors are connected together in either series, parallel or combinations of both, and that these circuits obey ohm's law.

However, sometimes in complex circuits such as bridge or t networks, we can not simply use ohm's law alone to find the voltages or currents circulating within the circuit. For these types of calculations we need certain rules which allow us to obtain the circuit equations and for this we can use kirchoffs circuit law.

In 1845, a german physicist, gustav kirchoff developed a pair or set of rules or laws which deal with the conservation of current and energy within electrical circuits. These two rules are commonly known as: kirchoffs circuit laws with one of kirchoffs laws dealing with the current flowing around a closed circuit, kirchoffs current law, (kcl) while the other law deals with the voltage sources present in a closed circuit, kirchoffs voltage law, (kvl).Kirchoffs first law – the current law, (kcl)

Kirchoffs current law or kcl, states that the "total current or charge entering a junction or node is exactly equal to the charge leaving the node as it has no other place to go except to leave, as no charge is lost within the node". In other words the algebraic sum of all the currents entering and leaving a node must be equal to zero, $i_{(exiting)} + i_{(entering)} = 0$. This idea by kirchoff is commonly known as the conservation of charge.

b) Kirchoffs current law

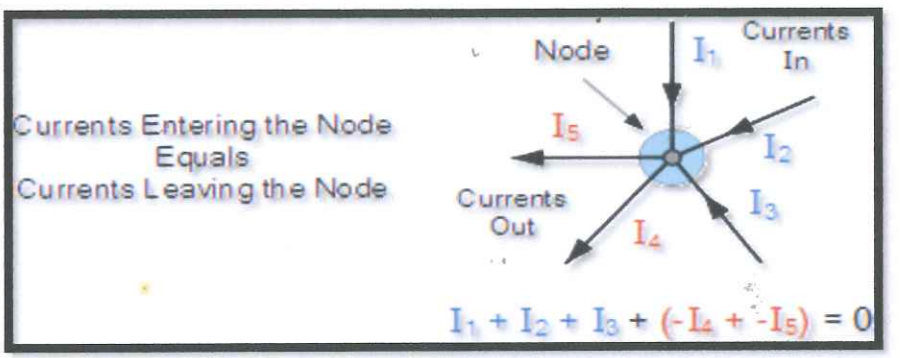

Figure 2.1 Kirchoffs current law

Here, the 3 currents entering the node, I_1, I_2, I_3 are all positive in value and the 2 currents leaving the node, I_4 and I_5 are negative in value. Then this means we can also rewrite the equation as;

$$I_1 + I_2 + I_3 - I_4 - I_5 = \longrightarrow \text{Equation one}$$

The term Node in an electrical circuit generally refers to a connection or junction of two or more current carrying paths or elements such as cables and components. Also for current to flow either in or out of a node a closed circuit path must exist. We can use Kirchoff's current law when analysing parallel circuits.

Kirchoffs Second Law – The Voltage Law, (KVL)

Kirchoffs Voltage Law or KVL, states that "in any closed loop network, the total voltage around the loop is equal to the sum of all the voltage drops within the same loop" which is also equal to zero. In other words the algebraic sum of all voltages within the loop must be equal to zero. This idea by Kirchoff is known as the Conservation of Energy.

i. Kirchoffs Voltage Law

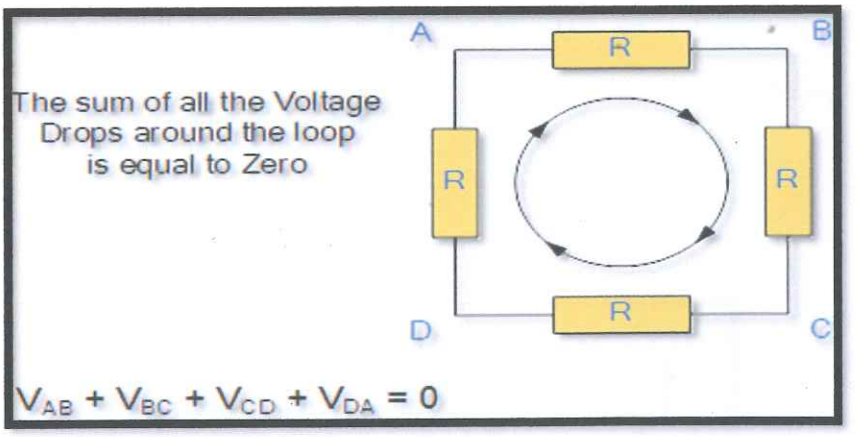

Figure 2.2 Kirchoffs Voltage Law

$$Vab + Vbc + Vcd + Vda = 0 \longrightarrow \text{Equation 2}$$

Starting at any point in the loop continue in the same direction noting the direction of all the voltage drops, either positive or negative, and returning back to the same starting point. It is important to maintain the same direction either clockwise or anti-clockwise or the final voltage sum will not be equal to zero. Can use Kirchoff's voltage law when analysing series circuits.

2.1 Voltage and Current Measurement

Ammeter is an instrument designed to measure the current. It is connected in series with the circuit elements to be measured. An ideal ammeter has a resistance of 0Ω and functions as a closed circuit, in series with the measured current element .

Voltmeter also is an instrument for measuring voltage and connected in parallel with a circuit element to be measured . The ideal voltmeter has infinite resistance and serves as an open circuit , parallel to the element being measured voltage.

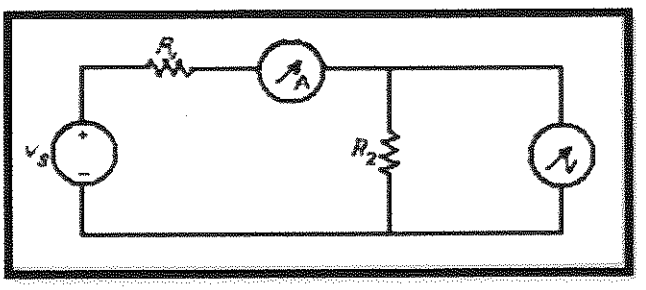

Figure 2.3 symbol voltmeter

Table 1.0 series parallel

Litar Siri	Litar Selari
nilai voltan : $V_J = V_1 + V_2 + V_3$	$V_J = V_1 = V_2 = V_3$
nilai arus : $I_J = I_1 = I_2 = I_3$	$I_J = I_1 + I_2 + I_3$
nilai rintangan $R_J = R_1 + R_2 + R_3$	$\frac{1}{R_J} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

V=RI ⟶ Equation three

I=V/R ⟶ Equation four

a) Parallel circuit

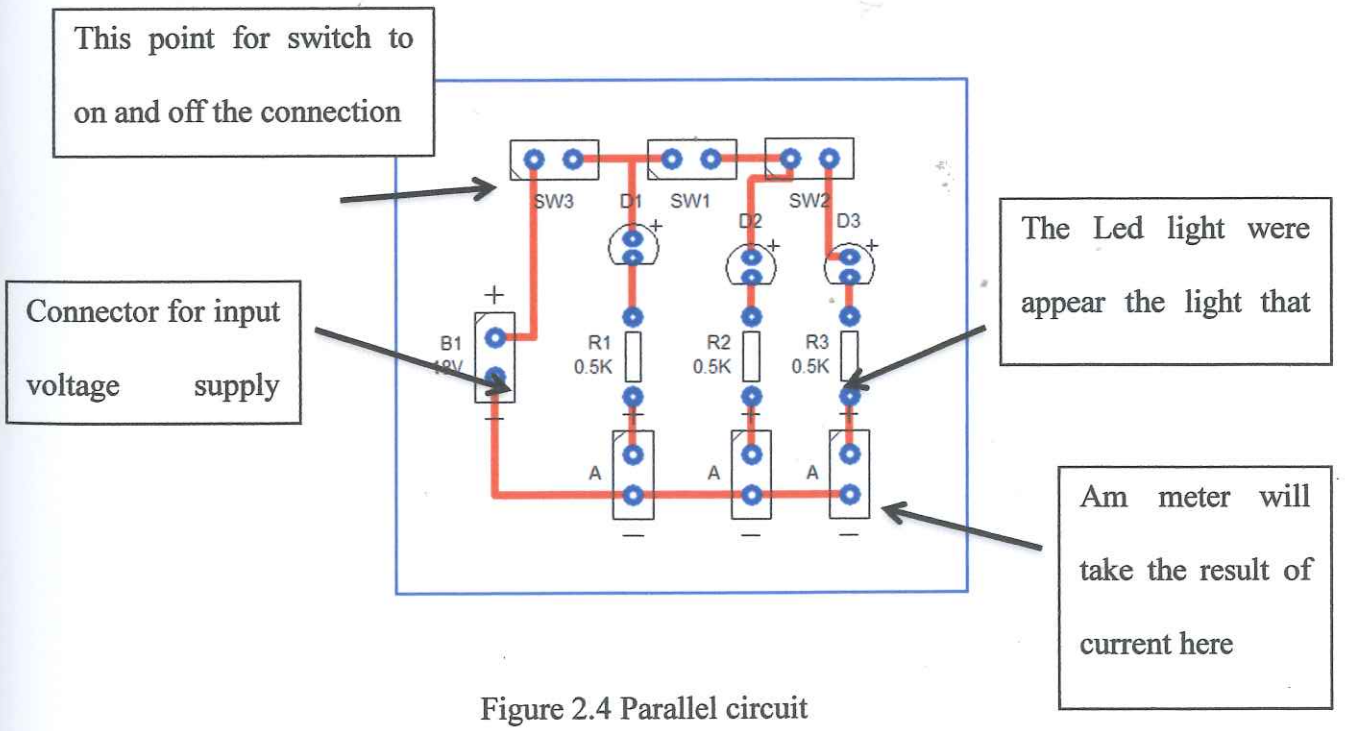

Figure 2.4 Parallel circuit

Calculation: Parallel circuit

V= IR ⟶ Equation five = Ohm's Law

V1=V2=V3=9v ⟶ Equation Six = Kirchoff voltage Law

IT=I1+I2+I3+I4 ⟶ Equation Seven = Kirchoff Current Law

RT= 1/(1/R1)+(1/R2)+(1/R3) ⟶ Equation Eight =R total

OHM'S LAW ⟶ Equation Nine= Calculation

$$RT = \frac{R1R2R3}{R1+R2+R3}$$

$$= \frac{470x100x1k}{470+100+1k}$$

= 470.011/ 29.936

IT = VS/RT

= 18V/470 ohm

=130.06 mA

IR1 = VS/R1

= 18V/470 ohm x RT

=29.92 mA

IR2 = VS/100ohm x RT

= 84.59 mA

IR3 =VS/1K x RT

= 15.55 mA

❖ Serial circuit

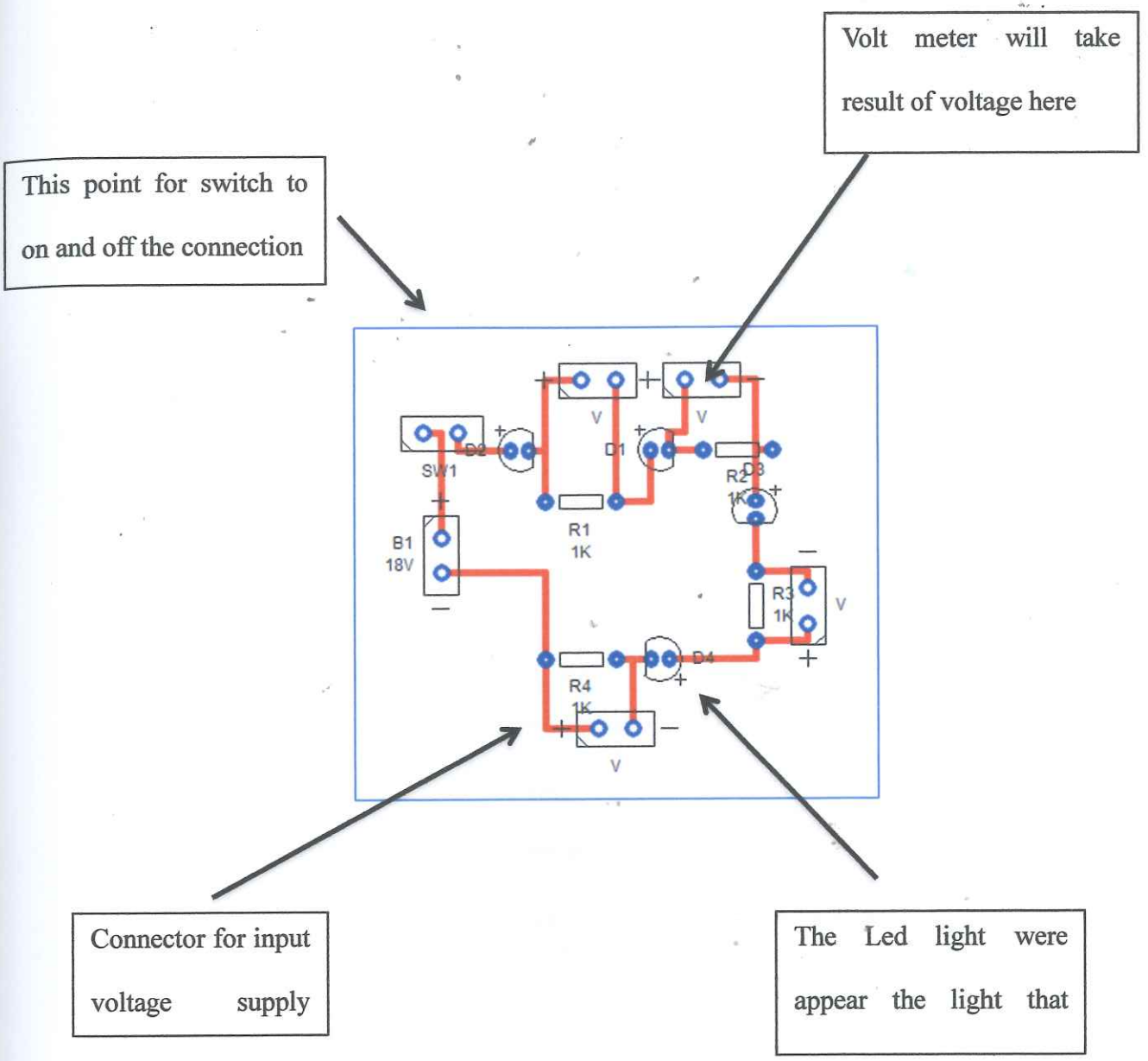

Figure 2.5 Serial circuit

Calculation: serial circuit

VT = VS ⟶ Equation Ten=Voltage Total

IT = I1= I2=I3=I4 ⟶ Equation Eleven=Current Total

RT =R1+ R2+ R3+R4 = 4K ⟶ Equation Twelve= Total Resistor

Vd =R/RT (VS) = 10.05V ⟶ Equation Thirteen= Voltage Drop

VR1 =R1/RT (VS) = 3.35V/ 4.5V

VR2 = R2/RT (VS) = 3.35V/4.5V

VR3 =R3/RT (VS) = 3.35V /4.5V

2.2 Production Of Pcb Board

The factors that must be determined before producing PCB board is:

- ❖ Functions and circuit applications.
- ❖ The sizes of the components want to install.
- ❖ The current and voltage rating that will be streamed on PCB board.

2.3 The Component Used

a) Connector

b) Resistor

c) Jumper

d) Battery 18v

e) LED

f) Switch

2.3.1 Resistor

Resistor that being use is 100 ohm, 470 k ohm, and 1k ohm. This resistor were chosen randomly because this circuit must being easier for student understand first before they had a other level. A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits resistors are used to limit current flow, to adjust signal levels, bias active elements, terminate transmission lines among other uses.

Figure 2.5 Resistor

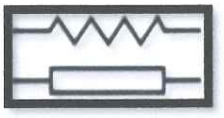

Figure 2.6 Resistor symbol

2.3.2 Terminal Block 2 pin

A similar arrangement is common with paired screw terminals, where metal tubes are loosely encased in an insulating block with a set screw at each end of each tube to hold and thus connect a conductor. These are often used to connect light fixtures and are shown at the right.

Alternatively, terminals can also be arranged as a terminal strip or terminal block, with several screws along (typically) two long strips. This creates a bus bar for power distribution, and so may also include a master input connector, usually binding posts or banana connectors.

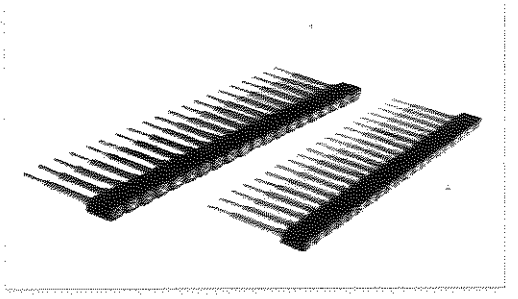

Figure 2.7. Terminal Block 2 pin

2.3.3 Battery 9v

An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes allow ions to move between the electrodes and terminals, which allows current to flow out of the battery to perform work.

Figure 2.8 Battery 18v

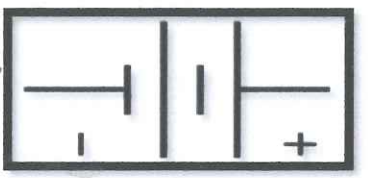

Figure 2.9:- Battery symbol

CHAPTER 3

METHODOLOGY

3.0 DESCRIPTION OF FLOW CHART

While doing work for the completion of this project, have done some advance planning before doing this project. Flow chart below shows some of the plans for this project. A flow chart is designed for smooth running of this project as well as helps solve problems step by step. The flow chart was used in analyzing, designing, documenting or managing a process or program.

Among the items listed are looking for ideas to design the project is a set the title of the project, designing the circuits and circuit analysis. Furthermore, we also estimated the cost of the project, buying the components used, install components and perform soldering circuit. Circuit testing is also performed to ensure that the system functions properly. This semester 9v to give the supply voltage, and successfully done the trainer.

Then the circuit were giving new connection with Led light and switch on the circuit .This 2 Project as shown the complete trainer with switch and led light on top of it After each circuit is completed, the Kirchoff circuit were give the value of current and voltage on the meter screen.

Table 3.1 Cost Item

Item	Qty.	Part Name	Cost 1 Unit	Cost all
1	4	Resistor	RM 0.20	RM 0.80
3	2	LED Green Diffused	RM 0.20	RM 0.40
4	1	PCB Board	RM 23.00	RM 23.00
6	1	Soldering Iron	RM 19.00	RM 19.00
7	1	Long Nose	RM 5.00	RM 5.00
8	1	soldering Tool	RM 6.00	RM 6.00
9	1	Multimeter	RM 22.00	RM 22.00
10	11	connector	RM 0.20	RM 0.40
11	3	Jumper	RM 0.70	RM 2.10
		TOTAL		**RM78.70**

3.1 FLOW CHART OF THE PROJECT

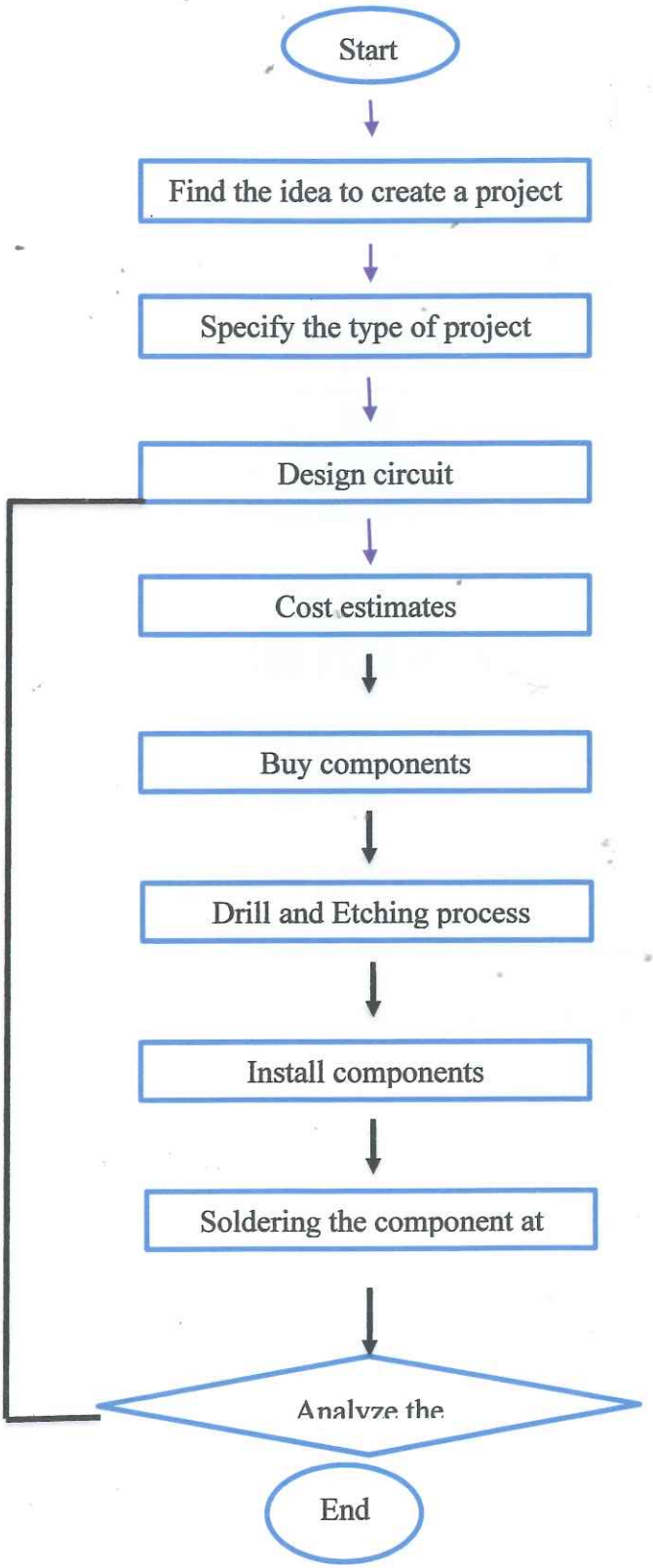

Figure 3.1 Flow Chart Of The Project

GANTT CHART PERLAKSANAAN PROJEK

Table 3.2 Gantt Chart

BIL	KemajuanProjek	Tempoh	TarikhMula	TarikhAkhir	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Meeting with supervisor	Every week	12/12/14	20/3/15													
2	Collect data project	1 week	8/12/14	14/12/14													
3	Buying component	1 week	15/12/14	21/12/14													
4	Design PCB circuit	2 days	29/12/14	31/12/14													
5	Etching/Soldering	4 week	5/1/15	6/2/15													
6	Testing	1week	9/2/15	13/2/15													
7	Final Proposal	5 week	16/2/15	20/3/15													
8	Presentation	1 day	20/3/15	20/3/15													

3.2 FIND THE IDEA & SPECIFY THE TYPE OF PROJECT

After receiving a briefing from the Chief Coordinator of the Project, we had a discussion and some planning to nominate a suitable title for the project with the help of supervisor. The purpose of the discussion and planning was done to facilitate the further implementation of our projects in order to complete this project within the stipulated time. Here are the things that need to be considered:

a) Time to complete the project

b) Access to components

c) The estimated cost of the project

d) The relationship between theory and practice

3.3 DESIGN & ANALYZE THE CIRCUIT

Circuit that being used for this project be modified to obtain the desired output, This battery 9v is giving supply voltage on it. Moreover the output 9v was being use on 2 Project for make a Kirchoff current circuit. The circuit were added by meter, and switch to make sure student get the easily trainer that they will able to understand the Basic of Kirchoff Law.

Figure 3.2 Trainer Box

3.4 ECTHING PROCESS

This process is done to remove the copper layer does not need and produce the PCB circuit on board.

i. **Lithering Process Using 'Exposure' Unit**

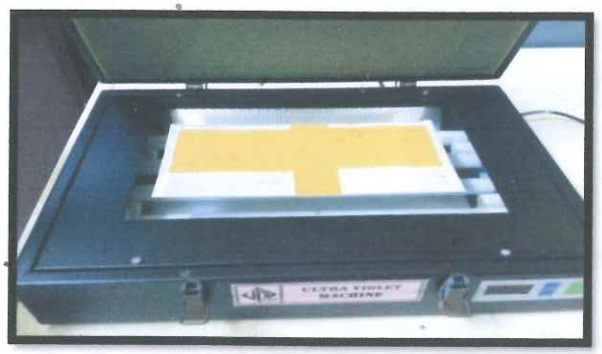

Figure 3.3 Exposure Unit

a) Must use UV board "PRE-SENTIZED STD".

b) Shaping the circuit on the PCB board.

c) Printing circuits on paper transference as a reference for the process of forming a circuit on the circuit board UV.

d) Remove the white sticker affixed to the board. White Sticker is designed to protect film on the surface of the board. Place the paper on the board last transference and enter into UV exposure unit for producing the circuit.

e) This process will produce a circuit with a light beam using a "fluorescent lamp".

f) This is the UV littering on board with the "exposure" unit.

g) This process only takes only about 5 minutes.

h) After completion of this process, we will be able to see the shape of the circuit on the PCB board, but it is less clear.

i) For the circuit shown more clearly, the next step is inserting the board into a liquid 'developer' to remove the layers of film that are not needed.