Designing and Implement a Low-Cost Practical Training Kit for the Electronic and Electrical Practical of the Advanced Level Technology Stream Students

Mini Project Final Report

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ABSTRACT

Many schools have started engineering technology. There is a shortage of equipment/tools to implement it. Especially in this covid-19 epidemic, advanced-level technical students became accustomed to online education, making it impossible for students to pursue electronic and electrical practicals, and not all students were able to pursue practicals from home. Lack of equipment for every student and high cost of equipment were among the main reasons for this. Therefore, this project aims to create a low-cost training kit for the electronic and electrical practical of advanced level technology students.

This model can obtain the outcomes of an oscilloscope. That training kit used Arduino technology. The input we provide is obtained from the Arduino panel and its output can be displayed by the computer. The probe provides the input from the circuits built into the circuit board to the Arduino board. We used software to get the output from the computer. After downloading the software and connecting it to the Arduino board, we can get the output. Therefore, no special displays are required to display the output. Output can be displayed on your computer. Therefore, advanced level technology students can do electrical and electronic practicals with this training kit at a low cost from the house.

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In addition, we would like to thank Mr.M.R.H.E. Bandara for introducing us to the working methodology,

CHAPTER 01: INTRODUCTION

Technology is very important to modern society. Nothing can be done without the technology of modern society. Therefore, a subject called Technology was introduced in schools. This subject consists of two parts. One is engineering technology and the other is biosystem technology. As well as laboratories for these subjects were also set up separately in schools. Three laboratories related to the subject of Engineering Technology were established here. They are electrical laboratory, mechanical laboratory, and civil laboratory. These laboratories have all the equipment required for A / L students for all practical activities. This practical working knowledge is very important for the technology students in their subject. The government has provided the most valuable tools and machinery for these laboratories. Some of them are never seen before. In that case, students move to do things with enthusiasm. Because they have a curiosity to study those tools and machinery. In these laboratories, students can be done subject-related practicals and some experiments with subject-related teachers. With this knowledge and tools, they can come up with new ideas and new designs. It is best for our society and our country. Through this subject, leads to the emergence of innovators in society.

We have identified a key issue. Due to this Corona pandemic, the student can't go to schools to study as well as they cannot do practicals. Everything learning with online study platforms. Teachers can teach subjects through online learning platforms as well as they can show how to do practicals with videos. But students cannot do physically practical activities. some practical activities can be done physically but most practical activities cannot do like practicals related to Oscilloscope. Practical activities are more important to a technology student. Electronic practical activities take precedence over other practical activities. Because so many students do not attend to do these electronic practicals. Because they fear to do those practicals. They can get an idea about how the practice works with watching videos but they cannot do them physically. This is a big problem for technology students. In that case, we decided to find a solution to this problem.

Every student who studies in Technology subject, have not much money to buy relevant tools to do practical activities. They can buy some small parts of the relevant circuits. They can make circuits according to their knowledge. But they have no relevant tools or machinery to test them. Because they are very expensive. Many Electronic practicals are related to

Oscilloscopes. Students will not be able to purchase an Oscilloscope for Oscilloscope practical activities. because it is too much expensive. Therefore, students faced a lot of problems when they go to do practical activities. As a solution, we made a low-cost Oscilloscope using the Arduino UNO board. This tool can improve students' expected skills. We target to improve their expected skills. Improving their expected skills, they can easily face their A/L exam practicals. They can do some practicals when the teachers teach them through this trainer kit.

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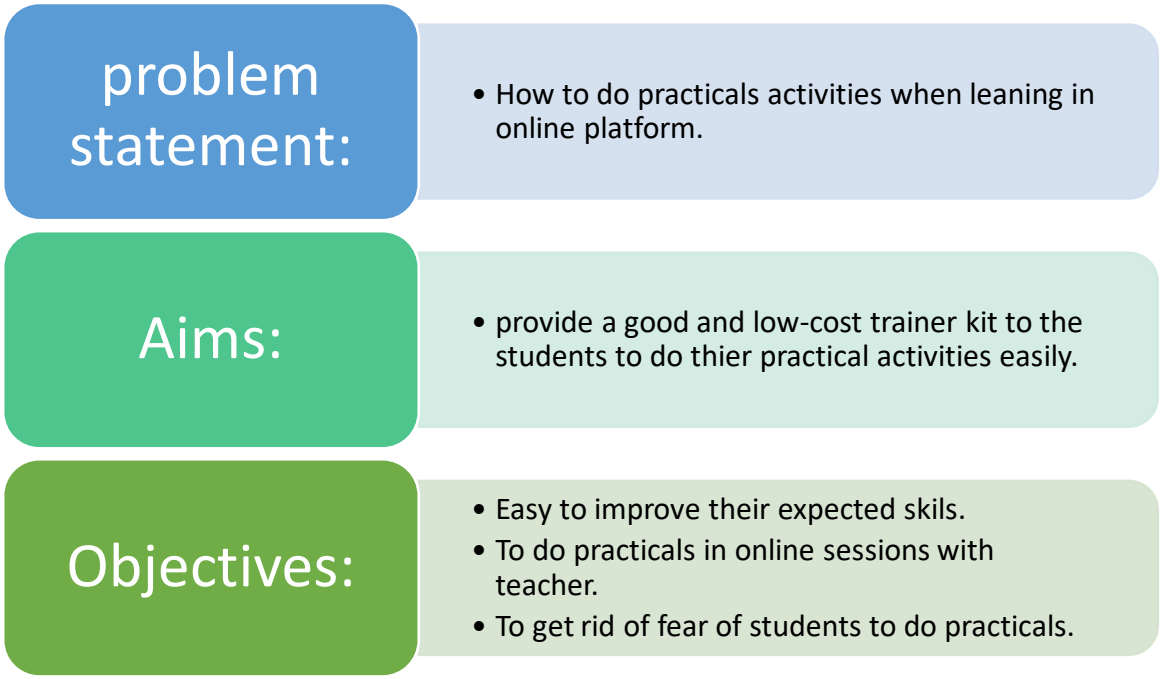


Figure 1 :(Aims & Objectives)

CHAPTER 02: LITERATURE REVIEW

Engineering technology is being taught at many schools. There is a scarcity of equipment and tools to put it into action. Advanced level technical students were accustomed to online education, making it impossible for students to undertake electronic and electrical practicals, and not all students were able to pursue practicals from home, especially during the Covid-19 outbreak. One of the main reasons for this was a lack of equipment for each student and a high cost of equipment. As a result, this project aims to provide a low-cost training kit for advanced-level technology students' electronic and electrical practicals.

Technology is critical in today's society. Without modern society's technology, nothing can be accomplished. As a result, technology was introduced as a topic in schools. There are two components to this subject. Engineering technology and biosystem technology are two of them. Separate laboratories for these disciplines were set up in schools as well. Here, three laboratories connected to Engineering Technology have been built. Electrical, mechanical, and civil laboratories are the three types. These labs offer all of the necessary equipment for A/L students to complete all practical exercises. This practical working knowledge is critical for technology students to succeed in their studies. The government has donated the most valuable tools and apparatus for these laboratories. Some have never been seen before. In that circumstance, pupils are motivated to get things done. They are curious about the tools and machinery and want to learn more about them. Students can undertake subject-related practicals and experiments with subject-related teachers in these laboratories. They can come up with fresh concepts and designs using this information and resources. It is in the best interests of our society and country. The rise of innovators in society is facilitated by this subject.

We've discovered a significant problem. Students are unable to attend school or participate in practicals as a result of the Corona pandemic. Everything may be learned with the help of online study tools. Teachers can use online learning platforms to teach subjects and use videos to demonstrate how to complete practicals. However, students are unable to participate in physically demanding activities. Some practical tasks, such as those involving an oscilloscope, can be done physically, but the majority of practical activities, such as those involving an oscilloscope, cannot. For a technology student, practical activities are more vital. Other practical activities take a backseat to electronic practical activities. Because a large number of pupils fail to show up for these electronic practicals. Because they are afraid of having to do the practicals. They can gain a sense of how the practice works by viewing videos, but they can't execute it. For technical students, this is a major issue. In such circumstances, we decided to find a solution to the issue.

An oscilloscope's results can be obtained using this model. The Arduino technology was employed in such a training kit. The input we offer comes from the Arduino panel, and the computer may display the panel's output. The Arduino board receives input from the circuits incorporated inside the circuit board via the probe. To get the output from the computer, we used software. After downloading the software and connecting it to the Arduino board, we can get the output. As a result, no special displays are needed to show the output. The output can be seen on a computer. As a result, advanced-level technology students can perform electrical and electronic practicals at home using this training package at a reasonable cost

2.1 Advantages of Oscilloscope

- We can measure the signal's amplitude and frequency, as well as determine whether the signal is of the expected shape.

- For the precise measuring of alternating current signals.
- The oscilloscope displays the signal's peak to peak amplitude as well as the signal's frequency.
- An oscilloscope's capacity to monitor the amount of AC ripple voltage riding on the DC voltage is one of its advantages; this makes it ideal for diagnosing DC power sources with excessive ripple caused by component failure.

- Oscilloscopes are primarily used to observe waveforms and are therefore less accurate than other types of testing equipment used to detect DC voltages.

CHAPTER 03: METHOD AND EXECUTION OF PROJECT

3.1. Introduction

An oscilloscope is an important and measuring instrument for capturing frequency signals. Capturing a frequency signal and getting its measurement is an expected learning outcome from the Advance level engineering technology stream students. But due to the pandemic situation of the country, most students are unable to physically interact with an oscilloscope and do the activities. So, they miss their opportunity to get the skill. Due to the expensiveness of the oscilloscope students face difficulty buying Ying doing activities at home.

To provide a solution to the above-mentioned problem, a low-cost trainer kit was developed. Our primary objective of this project is to provide the expected learning outcome of the oscilloscope-based practical activities. The learning aid kit contains two different units; the hardware unit and the interface software. As the interface software, we use a free and open-source program called Pc Scope by - Ramalingam Balaji. To get the expected learning outcomes we prepared 4 practical exercises for 4 skill levels and lab sheets for each practical exercise to perform on the learning aid kit.

Practical exercise –

- View resistance, capacitance, inductance, change in the presence of DC.
- See how the wave changes when the AC is subjected to full-wave rectification.
- observe the changes in the current of a circuit made by using 555ic.
- Observe the transmission of the transistor of a circuit made by using UM66 small music generated.

3.3 Circuit

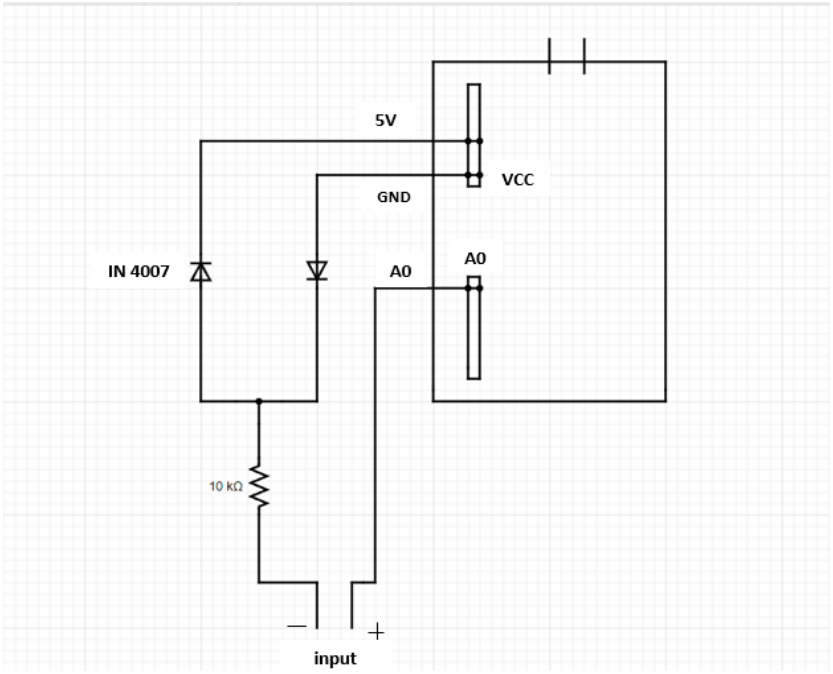


Figure 2(6.3 Circuits)

The circuit contains two IN 4007 diodes, 10KΩ resistor, and an Arduino Uno board. Diodes are used to direct the current towards only one direction. The resistor is used to protect the circuit components. The circuit and Arduino board link with the user's laptop or desktop through a USB cable. The user has to import the Arduino code to the board using Arduino IDE to establish the connection with the circuit and the interface software (PC Scope).

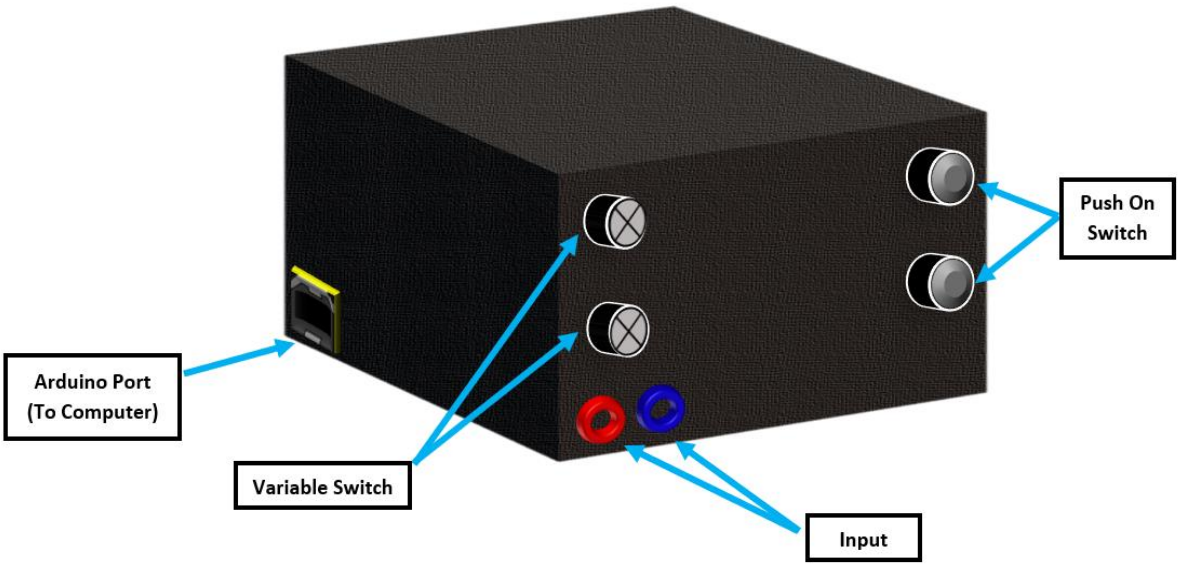


Figure 4 Our training kit unit

Figure 5 Real Unit

3.4 Interface

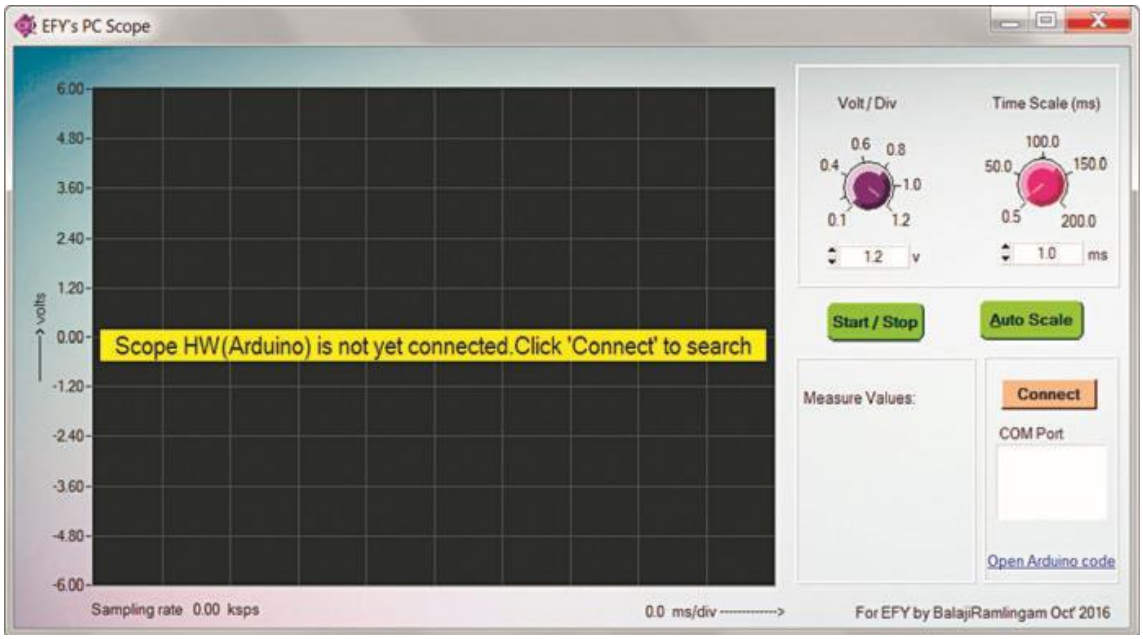


Figure 6:(6.4 Interface)

To observe the wave user has to first, install the program on a laptop or desktop. Then the user can click the connect button and establish the connection with the program and the hardware unit. Arduino board collects the input from the A0 pin of the board and then transmits it into the interface. Users can control the voltage and time scale using controllers of the software.

3.5 Timeline

Table 1:(6.5 Timeline)

	week 01	week 02	week 03	week 04	week 05	week 06	week 07	week 08	week 09	week 10	week 11	week 12	week 13	week 14	week 15	week 16	week 17	week 18	week 19	week 20
Planning																				
Gather information																				
Fabricate of project proposal																				
Analysis and designing																				
Study about needs																				
study about special requiraments																				
Buy needed requiraments																				
Designing circuit diagram of the project																				
Fabricate circuit diagram of the project																				
Develop labsheet																				
Testing																				
Perform system testing																				
Identify issues																				
Correct issues found																				
finalizing the project																				
final report preparing																				

3.6 Budget

Requirements what we need to build up this project. This project is based on microcontroller components.

1

Number	Items	Quantity	Price Per Units *(RS)*	Cost Estimation Per Items *(RS)*
1.	Arduino Board	1	1300	1300
2.	Diodes	2	5	10
3.	Jumper wire (normal)	5	5	25
4.	Resistor	3	3	9
5.	Variable Resistor	1	15	15
6.	Variable Switch	2	25	50
7.	Transformer	1	250	250
8.	Push Switch	2	10	20
9.	Casing	1	50	50
10.	Project Board	1	250	250
11.	Input/output Jac	4	50	200
12.	Wire	2m	25	50
13.	Other			250
	Amount			**2479**

CHAPTER 04: Result and discussion

We first discussed how to design a device that would help advanced-level engineering students in this project to support practical experiments under their subject. Here we discussed the possibility of creating a device that allows students to practice electronics testing in practical testing activities for a small fee and perform relevant training and study activities. We hope that this will enable students to perform electronic tests as well as self-study them at school as well as at home.

The main advantage here is that every student can get this training kit and use it to study electronic subject-related circuits even from home. We also hope that students who are interested in this field will be able to gain further knowledge using this device. With the creation of this low-cost practical trainer kit, we also discussed some of the practical activities that we have identified and how to use this device. To identify these practical activities, practical test activities are designed so that students can achieve their desired learning skills by studying the Advanced Level Engineering Technology syllabus.

During the testing of this device, we expected several results and in the first stage, the team members discussed what the device should be upgraded in addition to the features we identified earlier.

The result we expected here was,

- Tracking of direct current waves flowing through a simple circuit using our Trainer kit
- Study of waves received by an alternating current flowing through a simple circuit
- Studying the change in a wave in the face of a change in voltage.
- Studying the shape of a wave in the face of a change in time.

We planned to improve our Trainer kit so that students could acquire such skills. The device was developed in several stages so that such skills could be acquired. To do this, the team members had various discussions, obtained their opinions and studied various documents, and obtained the information we needed.

Here we have identified practical activities under 4 skill levels

Skill 1 - Study of output wave behavior of electronic devices with direct current voltage

Skill 2- Investigating methods for obtaining a constant simple voltage from alternating voltage using pn junctions

Skill 3- Using digital technology to control a process as needed using NE555 IC.

Skill 4- Using a UM 66 melody generator to see how a transistor develops in a finished circuit.

Under skill- 1 we intend to consider the following,

- Studies the waveform when applying a simple charge across a resistor, where it can be observed that the amplitude decreases as the resistance decreases and the amplitude decreases as the resistance increases.

- Considering the study of the waveform when supplying a direct current voltage to a capacitor, the direct current voltage at maximum charge at the capacitor charge decreases rapidly and gradually decreases to zero.

- Considering the application of a direct current through a Milgat inductor, when a straight edge is provided on either side of the inductor, the flow through the propellant increases rapidly and gradually decreases, and eventually reaches the maximum value.

Under these above skill levels, it is possible to easily use the device we have designed to study the output waves of the circuits and perform related calculations.

Figure 7:(waveform)

In addition to these skill levels, we designed and tested several simple electronic circuits to further test our device. It was very helpful to identify some bugs in the devices as well as to fix them. These diagrams show the results of our experiments

4.1 Lab Sheet

Skill - 1

The behavior of electronic devices with direct current voltage.

Skill Level 1.1

Applying a direct current voltage to a resistor.

Learning Outcome:
Identify the change in direct current voltage when the resistance value of a circuit changes.

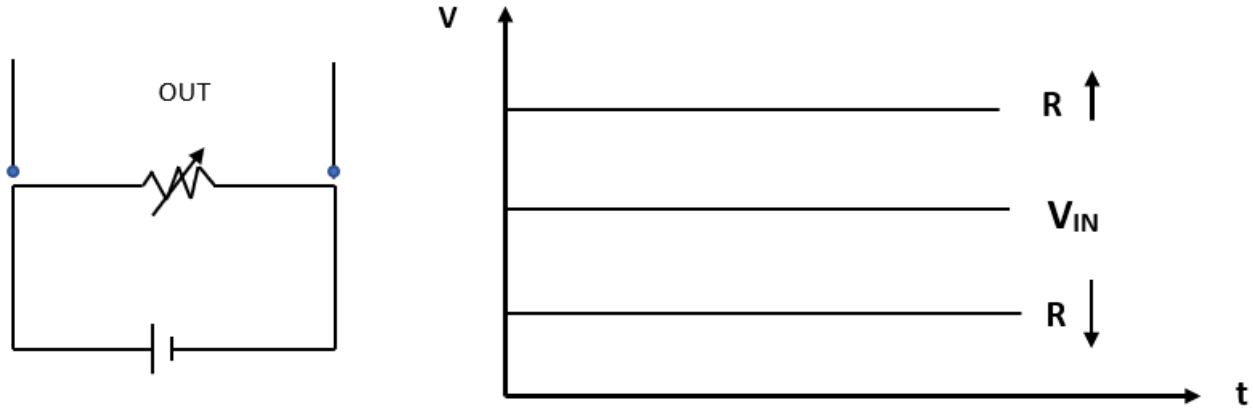
Expected Skills:

- Assembling a direct current circuit on a project board.
- Detection of direct current voltage manipulation with increasing or decreasing resistance.

Introduction:
When a direct current voltage is applied to both sides of a resistor, a current flow through it. The magnitude of that current depends on the value of the resistance. The lower the value of the resistor, the higher the current, and the higher the value, the lower the current. According to Ohm's law, the current flowing through a conductor when the temperature is constant is proportional to the potential difference between the two conductors.

That is, $V \propto 1/R$, here, the potential difference decreases as the value of the resistor increases.

As the value of the resistor decreases, the potential difference increases. $V \propto I$ Because the current behaves similarly to the potential difference.



Principle:
Connect a variable resistor to a direct current voltage and observe the potential difference on both sides of the resistor by varying the resistor.

Necessary equipment:

- Low Budget Trainer Kit
- Project Board
- Variable Resister
- Jumper Wires.
- Battery

Methodology:

i. Design the circuit as shown in the diagram.

ii. Once the circuit is set up correctly, connect the circuit you made correctly to the trainer kit we designed. **(Special: - Be sure to connect the terminals of your circuit to the correct terminals of the trainer kit here.)**

iii. Then connect the trainer kit to the computer to which the circuit is connected.

iv. After connecting to the computer, open the software called Pc Scope that we have provided.

v. Once the software is open, click on the pot button.

vi. After clicking the pot button, click on the connect button.

vii. There you can see the interface of an oscilloscope. Click the auto button next to the time & volt division button.

viii. If you have set up the circuit correctly and connected it to the trainer kit you can see the correct wave on the screen.

Observational guidance:

- Observe the potential difference changes by increasing the value of the variable resistor.
- Observe the potential difference changes, minimizing the value of the variable resistor.

Conclusion Instructions:

- As the value of the resistor decreases, the potential difference on both sides of the resistor increases.
- As the value of the resistor increases, the potential difference on both sides of the resistor decreases.

Highlights:
Through this practical activity you can get a clear idea of the Ohm's law.

Skill Level 1.2

Supplying a direct current to a capacitor.

Learning Outcome:

Detects the behavior of a direct current applied to a capacitor.

Expected Skills:

- Assembling a simple circuit on a project board.
- Identify the discharge and charge of a capacitor.
- Understand how a capacitor behaves with direct current voltage.

Introduction:

When a direct current is applied to both sides of a capacitor, an instantaneous current flow at the beginning. That is, when a voltage is applied to both sides of a discharged capacitor, it acts as a short circuit. Therefore, such a circuit does not generate a voltage on either side.

Therefore, a discharged capacitor shows a zero voltage at the starting point of the charge. Then the voltage gradually increases and eventually, the capacitor is fully charged and the voltage reaches its maximum. During discharge, there is a rapid drop in voltage, which then gradually subsides.

The graphs below show this voltage change over time. Thus, the voltage is maximized after the current taken through the capacitor is maximized.

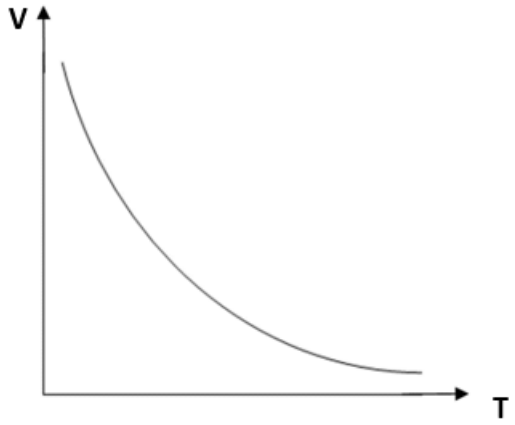


Figure 1: Capacitor discharge

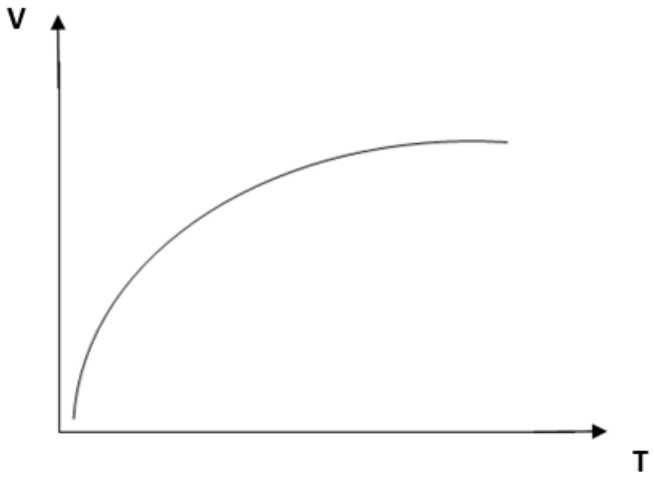


Figure 2:

Principle:

- Assign a direct current difference to a discharged capacitor and observe the potential difference on either side of it (capacitor).
- Assign a direct current potential difference to a charged capacitor and observe the shape of the potential difference on either side of the capacitor.

Required Equipment and Materials:

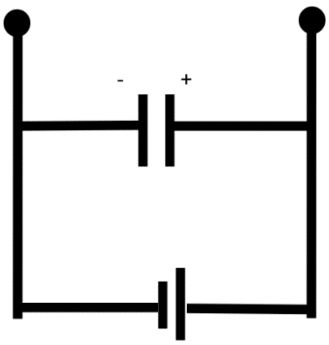
Low Budget Trainer Kit

Battery

Project Board

Capacitors (1000 uf)

Project Board Wires



Methodology:

i. Design the circuit as shown in the diagram.

ii. Once the circuit is set up correctly, connect the circuit you made correctly to the trainer kit we designed. **(Special: - Be sure to connect the terminals of your circuit to the correct terminals of the trainer kit here.)**

iii. Then connect the trainer kit to the computer to which the circuit is connected.

iv. After connecting to the computer, open the software called Pc Scope that we have provided.

v. Once the software is open, click on the pot button.

vi. After clicking the pot button, click on the connect button.

vii. There you can see the interface of an oscilloscope. Click the auto button next to the time & volt division button.

viii. If you have set up the circuit correctly and connected it to the trainer kit you can see the correct wave on the screen.

Observation Guide:

Apply a direct current voltage to a discharged capacitor and observe the shape of that voltage. Compare the discharge given above with the graph.

Similarly, observe the voltage pattern at the discharge of a charged capacitor.

Instructions for the conclusion:

- When a capacitor is charged, it can be seen that it starts from zero as in the graph and increases rapidly and gradually reaches its maximum level. (Figure 1)
- When a capacitor discharges, it starts at the maximum voltage as shown in the diagram, decreases rapidly, and gradually approaches zero. (Figure 2)

Special facts:

This charge on a capacitor is used as a 'smoothing' in the process of converting alternating current to direct current, or wave rectification.

Skill Level 1.3

Supplying a direct current to an inductor.

Learning Outcome:

Detects the behavior of a direct current applied to an inductor.

Expected Skills:

- Assembling a simple circuit on a project board.
- Understand how an inductor behaves with direct current voltage.

Introduction:

When a direct current voltage is applied to either side of an inductor, the current flowing through the inductor increases rapidly and gradually decreases, and eventually reaches a maximum value. When a trigger is short at both ends, the current decreases rapidly and then slowly decrease to zero.

An inductor is a coil of wire wrapped around a core. Therefore, there is a resistance to the inductor. But in solving problems it is considered that there are inductors without resistance. They are called "pure inductors."

Principle:

- Apply a direct current voltage to the inductor and monitor the voltage on either side of the inductor.

Required Equipment and Materials:

Low Budget Trainer Kit

Battery

Project Board

inductor

Project Board Wires

Methodology:

i. Design the circuit as shown in the diagram.

ii. Once the circuit is set up correctly, connect the circuit you made correctly to the trainer kit we designed. **(Special: - Be sure to connect the terminals of your circuit to the correct terminals of the trainer kit here.)**

iii. Then connect the trainer kit to the computer to which the circuit is connected.

iv. After connecting to the computer, open the software called Pc Scope that we have provided.

v. Once the software is open, click on the pot button.

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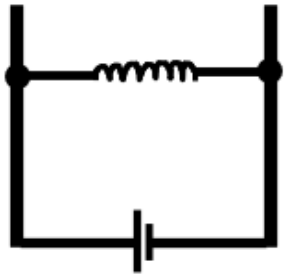
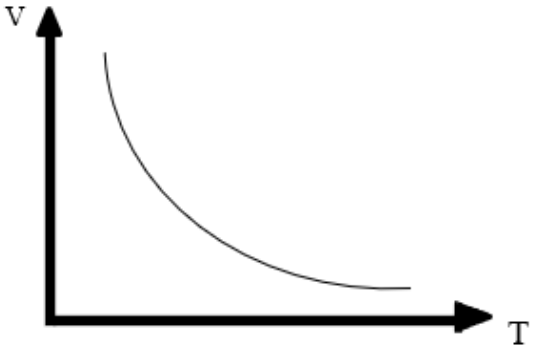
viii. If you have set up the circuit correctly and connected it to the trainer kit you can see the correct wave on the screen.



Guidance for observation:

An inductor is a wrapped wire coil. Therefore, there is a resistance. That is, as the current flows through the inductor, the temperature increases and the resistance increases and the potential difference on both sides gradually decreases.



In this case the battery is discharging.

Instruction for conclusion:

Observe whether the voltage on either side of the inductor behaves as shown in the diagram above.

Special fats:

Magnetic properties occur when a current flows through an inductor. It is measured as motivation.

Skill - 2

Investigates methods of obtaining a constant direct current wall voltage from alternating voltage using PN joints.

Learning Outcome:

- Assembles a full wave rectifier circuit using a center saver transformer.
- Assembles a full wave rectifier circuit using a bridge rectifier.
- Indicates that the simple input voltage level increases after the filter is applied and the corrugated board voltage decreases.

Expected Skill:

- Identify and position devices during assembly on a circuit board.
- Testing an assembled circuit.
- Converting an alternating voltage into a direct current voltage.

Introduction:

Dry cells cannot always be used for different direct current requirements. Converting alternating voltage to direct current is a more efficient and stable direct current supply method, especially for non-mobile applications. In that transformation it is very important to pay special attention to minimizing power loss and removing wrinkles. It is expected to provide the ability to assemble low voltage supplies using this utility.

Principle:

A diode can take advantage of the ability to flow current in only one direction and convert the alternating voltage to a direct current voltage. The main AC supply voltage is 230 V and the transformer is used to reduce the AC voltage to suit the function. It is possible to increase the AC voltage by filtering into such a circuit as it is disadvantageous to have a low voltage AC current supply even if the AC voltage is adjusted using low voltage transformers and diodes.

Necessary equipment and materials:

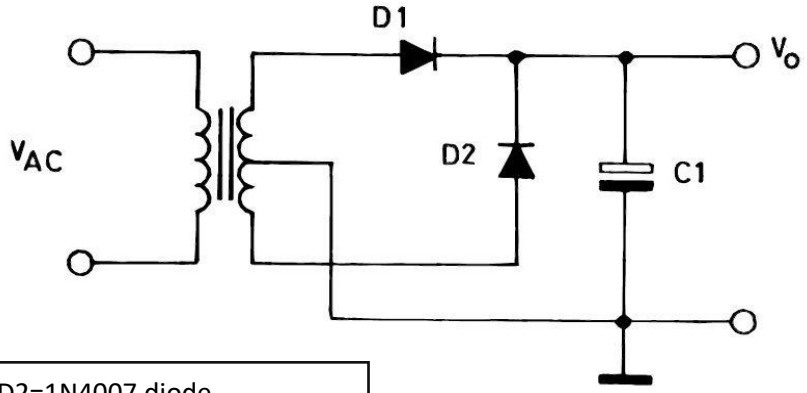
- **1N4007 Diode**
- **240V/3V/500MA Derivative transformer**
- **1000uf Capacitors**
- **Project board**

- **Project board wire**
- **Connecting wires**
- **Insulation tapes**

Methodology:

1) Create a full wave rectification circuit using a center tapped converter.

- Assemble the circuit below on the project panel.



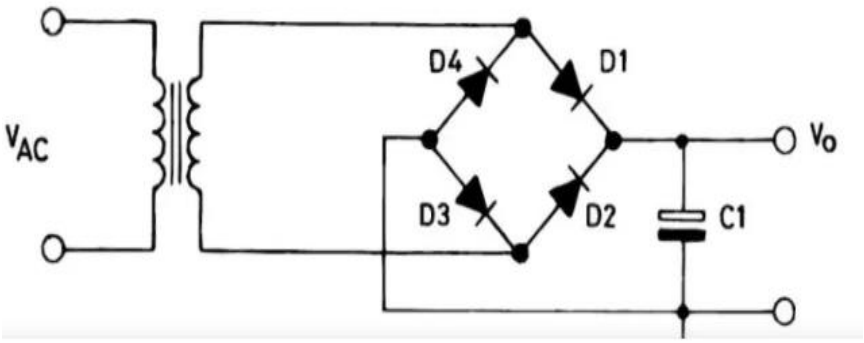
D1/D2=1N4007 diode

V_{Ac}=240v/3v/500mA transformer

C1=1000pf capacitor

2) Creating a circuit of a full-wave rectifier using a bridge rectifier.

- Assemble the circuit below on the project panel.



D1/D2/D3/D4=1N4007 diode

V_{Ac}=240v/3v/500mA transformer

C1=1000pf capacitor

i. Design the circuit as shown in the diagram.

ii. Once the circuit is set up correctly, connect the circuit you made correctly to the trainer kit we designed. **(Special: - Be sure to connect the terminals of your circuit to the correct terminals of the trainer kit here.)**

iii. Then connect the trainer kit to the computer to which the circuit is connected.

iv. After connecting to the computer, open the software called Pc Scope that we have provided.

v. Once the software is open, click on the pot button.

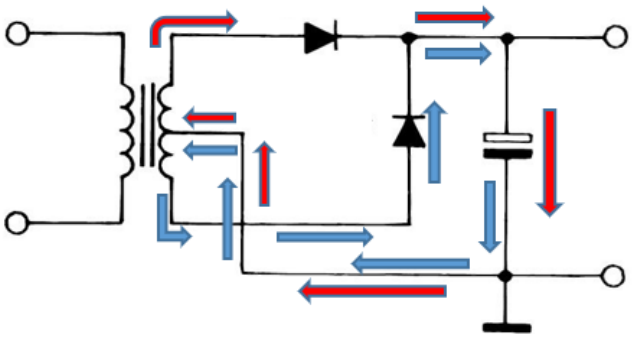
vi. After clicking the pot button, click on the connect button.

vii. There you can see the interface of an oscilloscope. Click the auto button next to the time & volt division button.

viii. If you have set up the circuit correctly and connected it to the trainer kit you can see the correct wave on the screen.

Guide to observation:

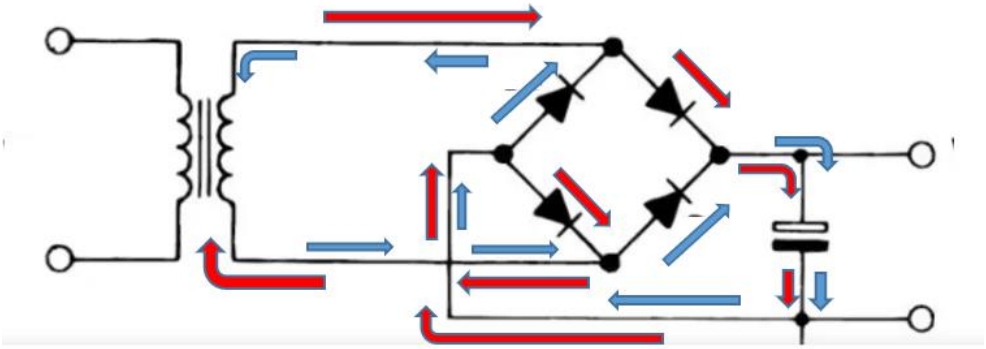
- Center tapped full wave rectification.



Using a center-tapped transformer and two rectifier diodes, a circuit can be set up according to the above method to convert an alternating voltage to a direct current voltage.

Where both the positive and negative terminals of the alternating voltage are converted to a direct current voltage.

- **Full wave bridge rectification**



All the positive and negative terminals of the alternating current can be converted into a direct current competition using two diodes.

Smoothness

- The direct current voltage received during full wave rectification is "pulsed".
- Therefore, a suitable capacitor must be applied to bring that voltage close to the linear nature. This process is called "smoothing".

Instructions for conclusion:

The alternating voltage can be converted to a direct current voltage using a diode.

Special facts:

Direct diodes are also used to protect electronic circuits. A diode bridge provides the correct polarity to the device no matter which terminal is connected to the direct current supply.

Skill - 3

Using digital technology to control a process as needed using the NE555 time circuit.

Learning Outcome: Using the NE555 time circuit as an unstable multivibrator.

Expected Skill:

- Lead detection of NE555 integrated circuit.
- Assembling a circuit with an integrated circuit board on a project board.
- Providing supply to an integrated circuit.
- Monitoring the shape of the output.
- Using unstable multivibrator output for various purposes.

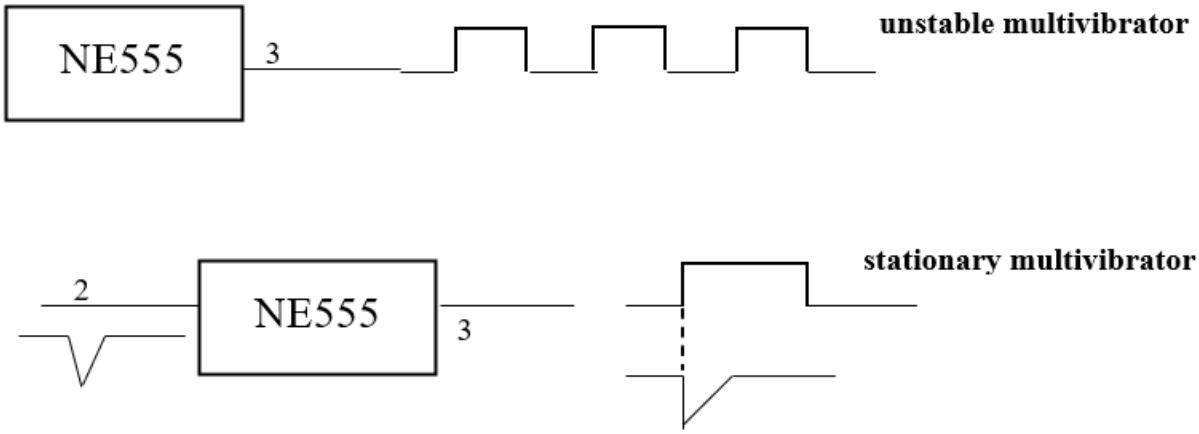
Introduction:

Time-sensitive circuits are needed to get a pulse for a certain period of time, moment (when a task needs to be started) or for a fixed period of time. To this end, an integrated circuit is created using devices and circuits used in electronics. An unstable multivibrator circuit is a basic circuit that can be assembled using these integrated circuits.

Principle:

NE555 is an integrated circuit designed to receive waves with intervals of seconds to hours. Two basic circuits can be assembled using this circuit and can be modified by changing only the value of the two resistors and the capacitor applied externally.

One of the two basic circuits is called an unstable multivibrator. It can receive square waves continuously once in a while. The other circuit is called the stationary multivibrator. The circuit allows the output to be maintained at a high voltage for a certain period of time and then restored to its original state.



The pulse amplitude of unstable multivibrator and the output current of unstable multivibrator at high voltages depend on the values of the resistors and capacitors connected externally to the integrated circuit. These values can be changed to change the amplitude of the pulse output of the unstable multivibrator and the pulse width of the output of the stationary multivibrator.

Required Materials and Equipment:

- Direct current supply
- NE 555 Integrated Circuits (IC)
- 330Ω/150Ω/10kΩResistors.
- 1000µF/0.01µF/47µF capacitors
- 1M resistor and 100kΩ resistors
- Project board
- Jumper wires

Methodology:

i. Design the circuit as shown in the diagram.

ii. Once the circuit is set up correctly, connect the circuit you made correctly to the trainer kit we designed. **(Special: - Be sure to connect the terminals of your circuit to the correct terminals of the trainer kit here.)**

iii. Then connect the trainer kit to the computer to which the circuit is connected.

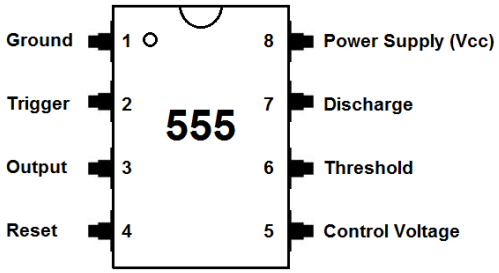
iv. After connecting to the computer, open the software called Pc Scope that we have provided.

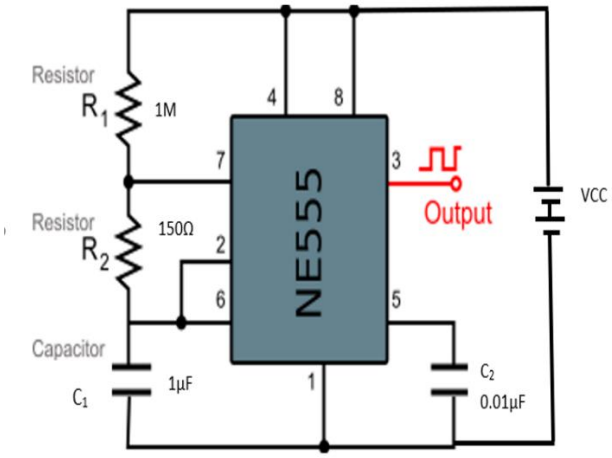
v. Once the software is open, click on the pot button.

vi. After clicking the pot button, click on the connect button.

vii. There you can see the interface of an oscilloscope. Click the auto button next to the time & volt division button.

viii. If you have set up the circuit correctly and connected it to the trainer kit you can see the correct wave on the screen.





Observation Guide:
Use the trainer kit we designed to monitor the waveform as the frequency of this circuit is high.

Conclusion Instructions:
An unstable multilayer circuit can be assembled via the NE 555 Integrated Circuit

Special Features:
It can operate in large range from 5v to 15v
This NE 555 closed circuit consists of 23 transistors, 2 diodes and 16 resistors

Skill - 4

Observe the increase of the circuit made from the UM66 melody generator.

Learning outcome:

Create a small signal generator using the voltage divider according to the given sketch.

Expected skills:

creating a circuit using transistor on a project board

Inclination as an amplifier.

Observe the voltage increasing of an amplifier.

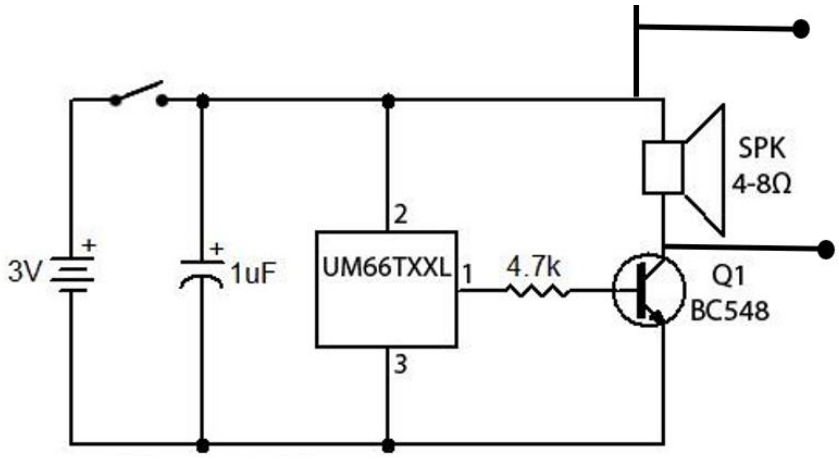
Usage of a signal generator.

Introduction:

A bipolar junction transistor is a type of transistor that can use as both switch and an amplifier. An amplifier amplifies the conductor power. For that you can increase the voltage or current or both. This practical test describes how a transistor amplifier can increase the main voltage.

Principle:

Bipolar junction transistor is a current control device. That is, the base current can be increased at a certain rate and obtained through the accumulator. Therefore, a signal must be transmitted into the transistor as a current wave. The amplifier is supplied with a signal voltage. The happens when output the signal. Therefore, the direct current bias voltage of the transistor must maintain at half the supply voltage. The alternating signal varies relative to the mean voltage applied to the base. In order to keep the direct current bias voltage at a neutral value, the value of the bias resistors must be changed. so that the output voltage signal is equal and relative to the output direct current voltage.



Required Materials and Equipment:

- 4.7 k resistors
- 3v battery
- UM66 Transistor
- BC 548 Transistor
- Speaker
- Capacitor 1uF

Methodology:

i. Design the circuit as shown in the diagram.

ii. Once the circuit is set up correctly, connect the circuit you made correctly to the trainer kit we designed. **(Special: - Be sure to connect the terminals of your circuit to the correct terminals of the trainer kit here.)**

iii. Then connect the trainer kit to the computer to which the circuit is connected.

iv. After connecting to the computer, open the software called Pc Scope that we have provided.

v. Once the software is open, click on the pot button.

vi. After clicking the pot button, click on the connect button.

vii. There you can see the interface of an oscilloscope. Click the auto button next to the time & volt division button.

viii. If you have set up the circuit correctly and connected it to the trainer kit you can see the correct wave on the screen.

4.2 Contents of the Advanced Level Curriculum covered by our Lab Sheets .

Skill 1

Devices used in electronic circuits can be divided into passive devices and active devices. This section describes the effect of varying the current flowing through passive devices such as resistors, capacitors, and inductors when direct voltages are applied to them. It focuses on the application of direct current voltages to inactive devices in the Basic Electrical Technology section of the Engineering Technology subject.

Skill 2

The process of converting an alternating current into a direct current is called straightening. It focuses on the application of knowledge of semiconductors in the field of engineering technology.

Skill 3

With the use of integrated circuits, very large electronic devices became smaller electronic devices. This section focuses on the applications of the NE555 IC in integrated circuits that we encounter in the field of engineering technology.

Skill 4

A transistor made using semiconductors instead of an electronic device called a valve is a turning point in electronics. In this section we will focus on the amplification process of a transistor and its applications.

CHAPTER 05: Conclusion

Using the low-cost trainer kit, we have created under this project, it is possible to easily perform and practice electronics practical testing under the Engineering Technology subject. When designing this device, we were concerned about its cost. This is because we want to design this device as cheaply as possible.
Students will then be able to obtain this device at a low cost and perform this practical test training. The main outcome we hoped for through this project was to produce an economically viable product that would be readily available to all students. Therefore, we designed this device to be as cost-effective as possible and to ensure that students get the most out of this device. Another unique feature of this device is that it allows students to perform practical test activities related to the field of electronics, which were limited to school laboratories, from home. It enhances their electronics skills and allows them to learn new things. Another benefit is that they have the ability to self-study topics related to this field.
Using this device, students will be able to get a clear idea of the currents flowing through simple electrical circuits and will also be able to study the output waves received through these circuits in the face of changes in voltage and time. This device can also be used for direct current as well as alternating current applications. It is also possible to study the output waves received through electronic circuits and perform related calculations. Also, this device is very small in size so it will be very easy for students to handle. The output waves received through this device can be easily viewed on a computer screen as well as the ability to study their behavior. This is a very easy and non-complicated process so that students can easily do the study.

Also, under this project, we have introduced some of the activities related to these practice tests as skill levels and by following and studying them the students will be able to gain some understanding of the practical test activities that they will face in the exam and it will be very important as a pre-training.
In summary, students can get the results mentioned through the low-cost practical trainer kit we have created under the project.

CHAPTER 06: FUTURE WORKS

The current epidemic of Coved-19 around the world has directly disrupted student education. Schools have closed and online education has begun to be provided. In the face of online education, doing practical activities will fail. This is because it is difficult for students to obtain individually the various laboratory equipment required for practical activities. Also, mainly those of equipment is very expensive.

To avoid these problems to some extent, we carried out this project. This project will enable students to develop their knowledge by performing activities related to the "Oscilloscope" at home. The main advantage here is that this device can be manufactured at a low cost. Our device can monitor the current-carrying waves in different circuits. (Corresponds to the Oscilloscope device)

In the face of online education in the future, there is no need to repent without engaging in practical activities. Our low-cost equipment allows you to practice practical activities at home.

This will help students in the future,

- Circuit wave monitoring.
- Variation in front of circuit wave voltage.
- Variation in front of circuit wave time.

Will be able to troubleshoot circuit-related problems.

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- (• (Arduino Oscilloscope https://www.instructables.com/Arduino-Oscilloscope/))