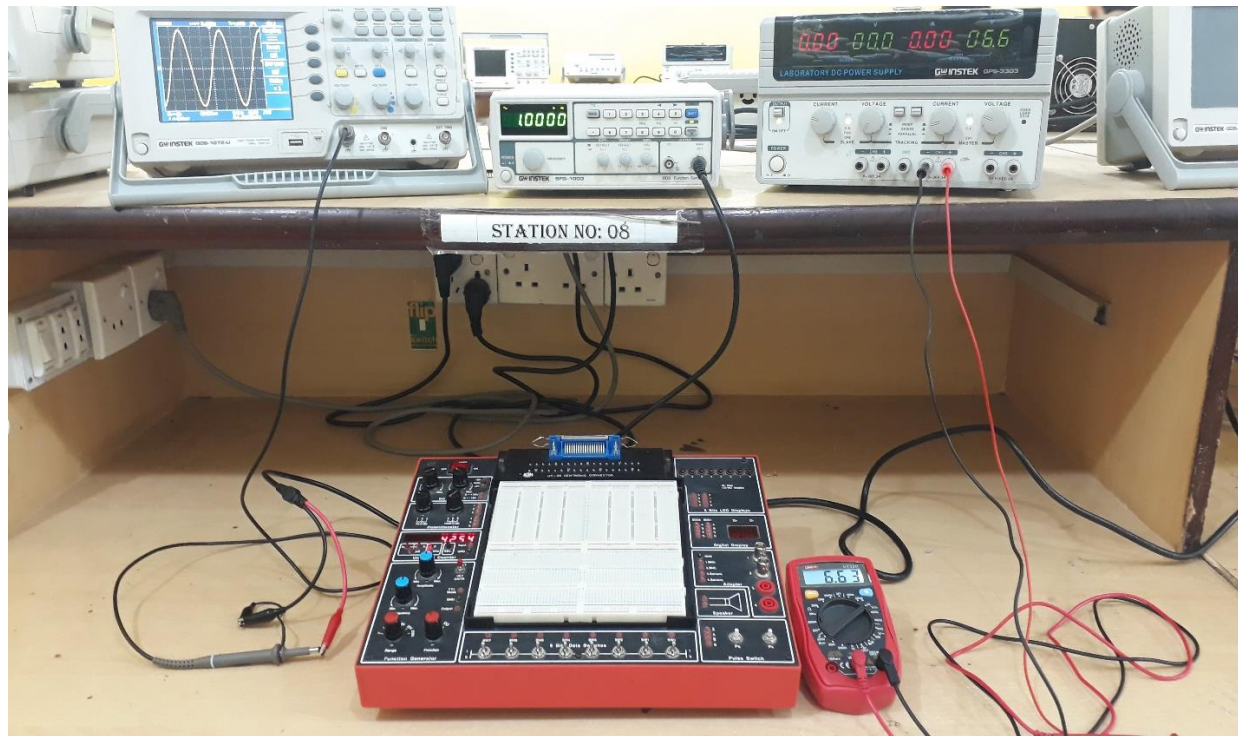# Pictorial View Of Lab

Figure 1: Pictorial View 1

Figure 2: Pictorial View 2

Figure 3: Pictorial View 3

Figure 4: Pictorial View 4

Course Description

1) Electric Circuits

This course introduces students to basic of electric circuits through a series of experiments. This includes the working principles of resistors, capacitors and inductors. Students learn different experimental techniques to determine the values of combination of different circuits.

a. Course Meeting Times

Labs: 1 session / week, 3 hours / session

b. Description

This laboratory course will help the students in getting familiarized with basic electrical measurement techniques, enhancing ability to apply electrical theory to practical problems, practice in recording and reporting technical information, familiarization with electrical safety requirement and also verification of some basic electric circuits theorems like KCL, KVL, Superposition, Norton, Thevenin etc. Foci include:

- Introduction to electrical equipment's, components and method to determine resistance and capacitance.
- Series, Parallel and Complex resistive circuit energized by DC source.
- Verification of different laws of Electric Circuits.
- To study the properties & conversion of the delta star connection.
- Introduction to MULTISIM Software and how to use it to solve your circuits.

2) Electronic Devices and Circuits

This course introduces students to the next level of basic of electric circuits. In this the students will use different types of diodes and bipolar junction transistors (BJTs) and have a learning how the ideal theoretical responses differ from the experimental results and how readings on a same device can differ from person to person because of different involvement of errors.

a. Course Meeting Times

Labs: 1 session / week, 3 hours / session

b. Description

This laboratory course will help the students in understanding the use of different types of diodes and bipolar junction transistors. They will have a learning of how the voltage barriers in these devices help circuits and equipment's to control or even switch at particular times. Foci include:

- Different types of diodes used.
- Different combination of diodes like series and parallel, also in determining the results using clipping and clamping circuits.

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- To determine the different types of transistors, usage of their different configurations and finding the Q points and comparing results with theoretical readings.
- Be familiarized with Diode Resistor Logic and Transistor Transistor Logic.

3) Digital Logic Design

This course introduces students to the digital level of basic electronics. In this the students will get to know how the backend of a simple computer chip works, i.e. on zeros and ones. In digital logic design students will experiment using different logic gates, latches, flip flops and combinational and sequential circuits with the effect of timers.

a. Course Meeting Times

Labs: 1 session / week, 3 hours / session

b. Description

This laboratory course will help the students in understanding the use of different types of logic gates and also their practical implementation in their daily lives. This course helps one understands the basics of the digital world and how mainly things operate while they are programmed. With the use of logic gates, they will get to know how to use timers, latches, flip flops and furthermore the implementation of combinational and sequential circuits. Foci include:

- Usage of different logic gates like AND, OR, NOT, NAND, NOR, XOR and XNOR.
- Usage of different timer ICs and their implementation.
- Usage of latches and flip flops and their real time implementations.
- Solving different complex problems and generating their own solutions.
- Solving different combinational and sequential circuits and their implementation.

4) Electronics Circuit Design

This course introduces students to higher level of transistors, i.e. Junction Field Effect Transistors (JFETs) and Metal Oxide Semiconductors Field Effect Transistors (MOSFETs). The operation of Operational Amplifiers, their implementation and usage in different circuits with their configurations.

a. Course Meeting Times

Labs: 1 session / week, 3 hours / session

b. Description

This laboratory course will help the students in understanding the different configuration usage of JFETS and MOSFETs. Also their implantation in real life scenarios and finding the difference between theoretical and experimental observations. Later the use of Operational Amplifiers will be introduced with its different configuration implementations and real life scenarios use. Foci include:

- Observation of different configurations of Junction Field Effect Transistors (JFETs).
- Observation of different configurations of Metal Oxide Semiconductor Field Effect Transistors (MOSFETs).
- Introduction to Operational Amplifiers and its different configurations.
- Implementation of these in real life scenarios.

Expected Laboratory Conduct

Each lab session will begin with an orientation. The lab instructor will respond to questions and convey essential, tacit, knowledge regarding the smooth conduct of the experiment. The lab instructor will be available throughout the three hours to provoke your thinking in response to questions that you pose.

The laboratory exercise is not a test. It is a 'hands-on' experience meant to show the relevance of theoretical concepts to understanding the behavior of real hardware and instrumentation and, at the same time, reveal how non-ideal conditions and some very 'un-theoretical' events can obscure the theoretical behavior.

There are twelve stations in the lab. You will work in groups of two or three. While you are to collaborate in setting-up and running the experiments, each of you individually will be responsible for a report of your experiences. Procedures for each experiment, are to be read before the start of lab.

The most successful experiments in science and engineering are those in which you know what the outcome will be before you start. Indeed, you cannot design an experiment without knowing something about the range of possible deflections, a safe loading of the structure, an instruments sensitivity to some external, disturbance, and the like. So while the experiment is in progress, one of your team member should do a rough calculations of the given circuits, as you move along. Make the most of your time to ensure that you have 'quality' data by comparing your theoretical results with experimental ones.

Available Equipment

1) Trainer Boards

Figure 5: Trainer Board

Concerned Courses	Electric Circuits, Electronic Devices and Circuits, Digital Logic Design and Electronic Circuit Design
Features	• Fixed (-5V & +5V) and Variable (0 – 12V) Power Supply • Built in Function Generator with 3 different types of waves as input and frequency display • 8 Digital Switches • 8 output LEDs • Speaker attached • BCD to 7 Segment display options

2) Power Supplies

Figure 6: Power Supply

Concerned Courses	Electric Circuits, Electronic Devices and Circuits, Digital Logic Design and Electronic Circuit Design
Features	- Fixed Supply of 5V 2 Variable Supplies of 0 - 30V - Max 3A current rating - Can be used in series for up to 60V supply - Overload/Short indication

3) Function Generators

Figure 7: Function Generator

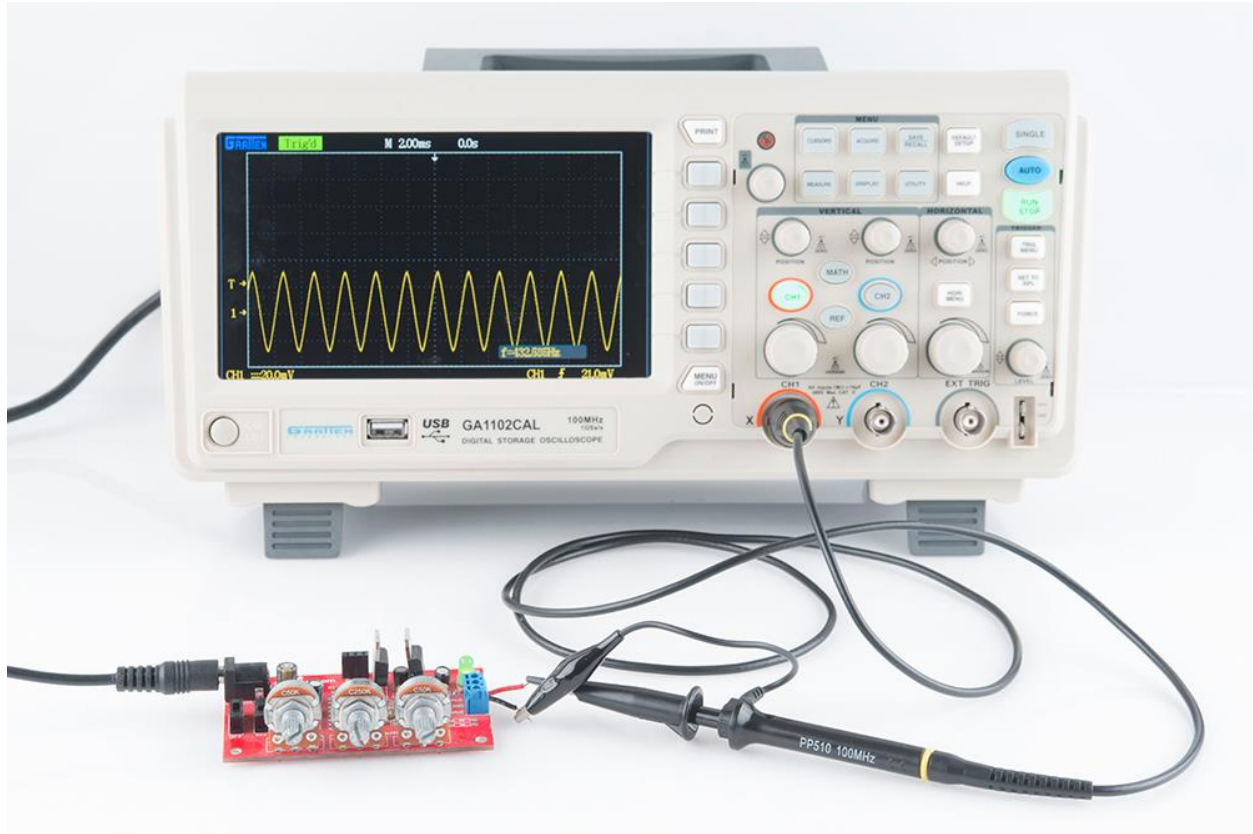| Concerned Courses	Electric Circuits, Electronic Devices and Circuits, Digital Logic Design and Electronic Circuit Design
Features	- Square, Triangle and Sine waves generator - Amplitude, Duty Cycle and Off Set Adjustment 0 – 3 MHz frequency range - TTL mode available - Keypad input available for setting frequency

4) Digital & Analog Oscilloscopes

Figure 8: Oscilloscope

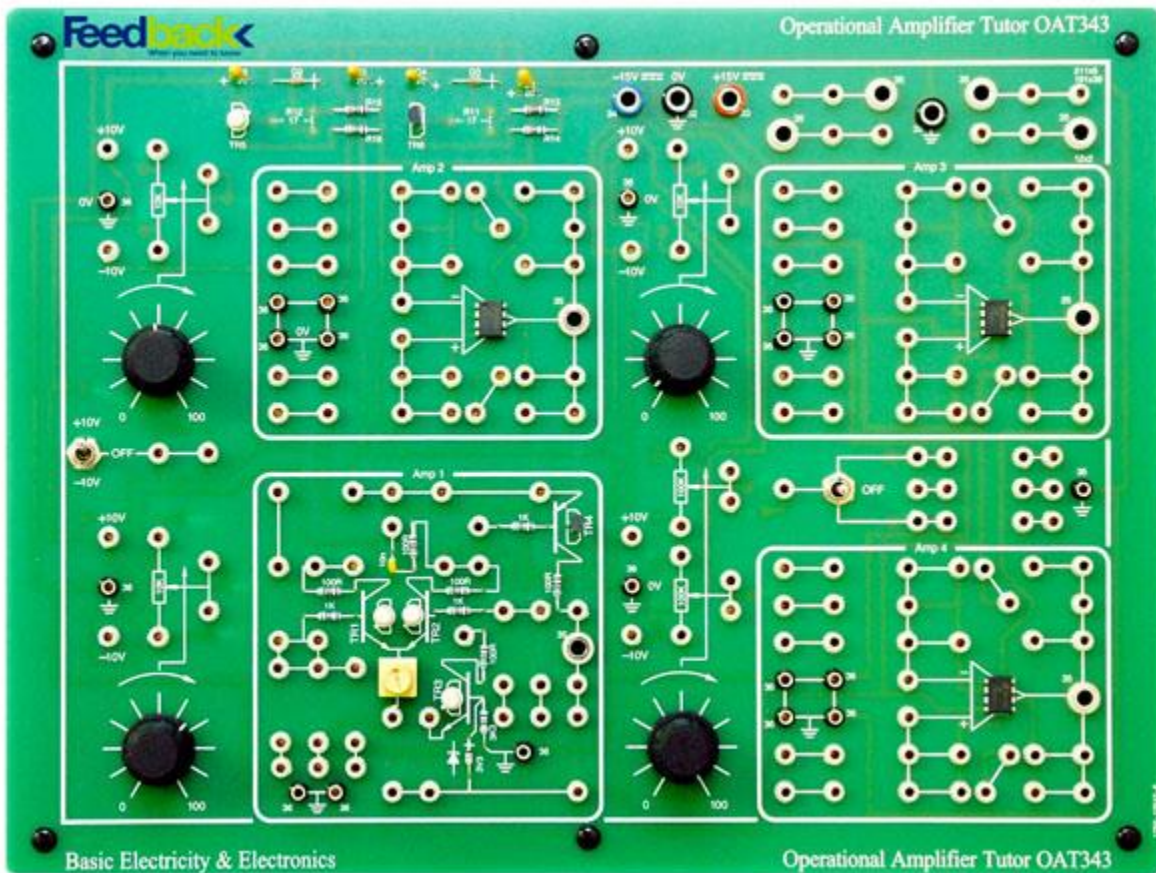| Concerned Courses	Electric Circuits, Electronic Devices and Circuits, Digital Logic Design and Electronic Circuit Design
Features	2 channel input Digital Oscilloscopes - Multi wave view available - Manual adjustment of time period on x-axis and voltage on y-axis - AUTO adjustment mode available

5) Operational Amplifier Trainer Kit (FEEDBACK)

Figure 9: Feedback Operational Amplifier Trainer

Concerned Courses	Electronic Circuit Design
Features	• 3 Op Amp based configurations with user to set ports for the easiness of the performing of the experiments • 1 differential amplifier circuit using JFET. • Power Supply -15V -- 0 -- 15 V dedicated • Plug and play scenario, easy to connect resistors capacitors and inductors for different experiments.

6) FEEDBACK TEKNIKIT (Engineering Teaching Solutions)

i)   Console:

Figure 10: Feedback Teknikit Console

Concerned Courses	Electric Circuits, Electronic Devices and Circuits, Digital Logic Design and Electronic Circuit Design
Features	4-channel oscilloscope - Digital multi-meter (x2) - Digital Analyzer - Function Generator - Frequency Counter - Integrated USB interface for external measuring instruments - USB charging socket for tablets - Light strip and LEDs for status display - Interfaces: Network interface 100 MBits RJ45, Wi-Fi, USB - Security lock for fastening the experimentation board - Anti-theft protection (Port for Kensington lock)

ii) 14-110 Electronic Components I

Figure 11: Feedback Teknikit Electronic Components I

Concerned Courses	Electronic Devices and Circuits
Features	• Diode characteristics • Characteristic of a Z diode • Characteristic of an LED • Diode branches in a transistor • Input characteristic of the transistor • Output characteristics of the transistor • Control characteristic of the transistor • Power dissipation of a transistor • Characteristic of a phototransistor • Darlington circuit • Operating point of a transistor • Transistor in a common emitter circuit • Transistor in a common collector circuit • Transistor in a common base circuit • Transistors in timer circuits

iii) 14-111 Electronic Components II

Figure 12: Feedback Teknikit Electronic Components II

Concerned Courses	Electronics Circuit Design
Features	- Design of the FET - Transfer characteristic of the JFET - Output characteristic family of a JFET - JFET as a switch - Characteristics of the MOSFET - The MOSFET as a switch

iv)   14-112 Digital Technology I

Figure 13: Feedback Teknikit Digital Technology I

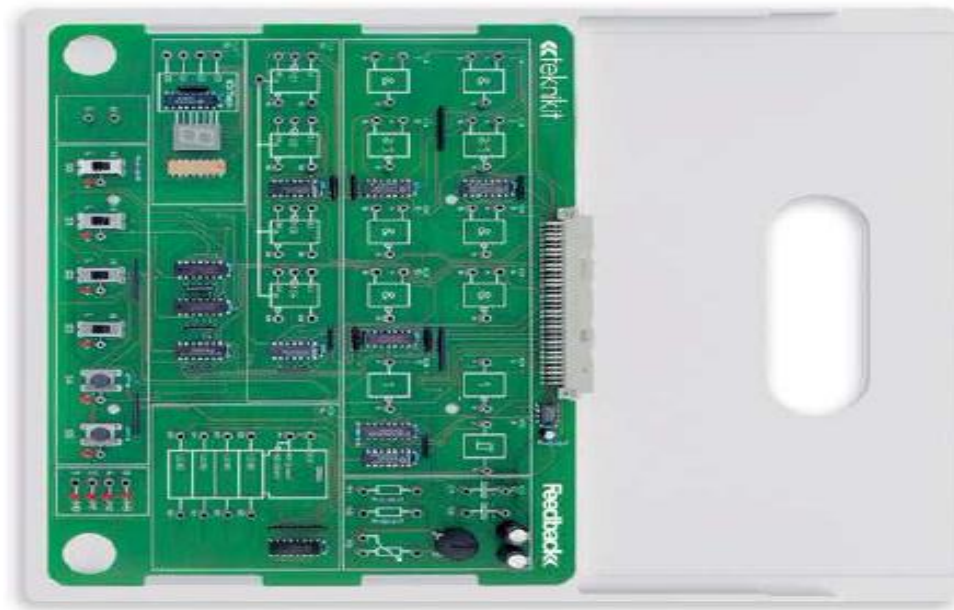| Concerned Courses	Digital Logic Design
Features	- TTL AND gates - TTL OR gates - TTL NOT gates (inverters) - TTL XOR gates - Boolean operations - De Morgan 's law - TTL NAND gates - Associative law - Distributive law - Karnaugh maps - Coding - Seven-segment displays - Half- and Full -adders - Multiplexers / DE multiplexers - Fault simulation

v)   14-112 Digital Technology II

Concerned Courses	Digital Logic Design
Features	- Flip-flops - RS flip-flops - RS flip-flops with clock input - Monostable and astable multivibrators - Schmitt triggers - D flip-flops - JK flip-flops - JK master-slave flip-flops - Frequency dividers - Counters - Shift registers - Parallel-serial converters

7) Other available items

Figure 15: Available Items

Concerned Courses	Electric Circuits, Electronic Devices and Circuits, Digital Logic Design and Electronic Circuit Design
Features	- Resistors (different values available) - Capacitors - Inductors - Diodes (Normal, Zener, Schottky etc) - Logic Gates (AND, OR, NOT, NOR, NAND, XOR, XNOR, different 2 and 3 inputs available) - Timer ICs - Operational Amplifier ICs - Junctions Field Effect Transistors - Bi Polar Junction Transistors 7 segment Displays - Latches, Flip Flops and Counters. - MOSFETs

FOR ANY QUERIES REGARDING ELECTRONICS LAB, KINDLY EMAIL ME AT:
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