

## INTRODUCTION

We are living in an age of Information Technology. Electronics is at the very foundation of the Information and Computer Age. The giant strides that we have made in the areas of Communications and Computers are possible only because of the great successes that we have achieved in the field of Electronics.

It is sometimes unbelievable, how many electronics gadgets that we carry these days in our person – Digital Wrist-watch, Calculator, Cell-phone, Digital Diary or a PDA, Digital Camera or a Video camera, etc.

The different types of Electronic equipments that has invaded our offices and homes these days is also mind boggling. Many things we use at home and office are “remote controlled”, for example, Television (TV), Air-Conditioners, Audio equipment, Telephone, etc. It is almost close to “magic” how even a child, now-a-days, can switch channels, or increase decrease the volume of sound in a TV at home by just clicking on a few buttons sitting at the comfort of a sofa away from the Television apparently without any physical wiring or connection!

Again, we are astonished, how we are able to talk to our near and dear living several thousands of kilometers away, from wherever we are, at home, office, on the road in a car, or in a classroom – by just clicking a few numbers on our palm sized cellular phones!

Electronics has made deep impact in several vital areas such as health care, medical diagnosis and treatment, Air and space travels, Automobiles, etc. In short, the technological developments of several countries of the globe are directly related to their strengths in electronics design, manufacture, products and services. It appears as though we have to add inevitably an “E” to the three “R”s, namely, Reading, wRiting, and aRithmetic, to declare a Man or Woman to be “literate”! Needless to add that the “E” here means “Electronics”! Thus Electronics has become surely a “Basic Science”. It is no more an “applied science”. Just as we teach physics, chemistry, biology and mathematics in our schools, it is high time we start teaching our children at school, Electronics as a separate subject by itself.

This brings us face to face to an important question : How to teach the basic concepts of such an important subject like Electronics most effectively? If one wants to gain a good understanding of electronics, he or she should build circuits and test them independently. For this one should acquire a practical knowledge of the characteristics of different devices and in constructing the various circuits. Let us try to learn such skills by the proven scheme of “ **LEARNING BY DOING**”.

An old Chinese Proverb says:

- I Read - I Forget
- I See - I Remember
- I Do - I Understand

There is only one way to learn to do anything: JUST DO IT!

## LEARNING BY DOING

That is the way we all of us have learnt even as a child- to talk, walk, ride a cycle,etc.,.Many arts and special skills like dancing, singing swimming, and martial arts are all learnt by going to an expert or a teacher who makes us learn by doing rather than by listening to lectures or reading books.

Why “learning by doing” is so important? Because, while doing we tend to fail and failures are very important in the learning process. Once we fail we start analyzing what went wrong. Thus at the point of failure a profound learning takes place. That is why people say:

FAILURES ARE STEPPING STONES TO SUCCESS!

In order to master the basic principles of electronics one has to study about the different components, circuits And measuring instruments used in electronics. There are two types of components that we come across namely **Active** and **Passive** components.

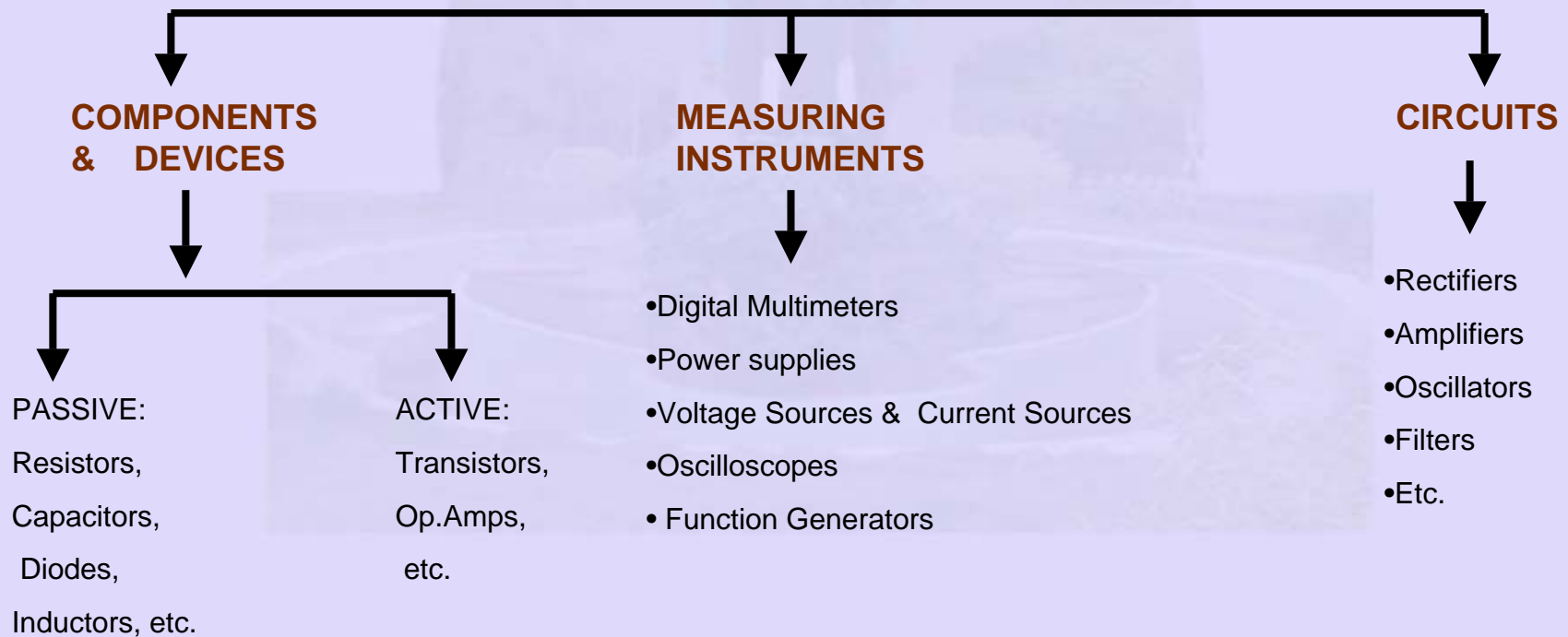
Resistors, Capacitors,etc., are known as passive components because they can only attenuate the electrical voltage and signals And cannot amplify. Whereas devices like transistors, operational amplifier(Op Amp) can amplify or increase the amplitude And energy associated with the signals. Hence the transistors and OpAmp come under active devices.

These components can be combined in different configurations by interconnecting them with conducting wires to build different useful Electronic circuits. We would here study about rectifiers, amplifiers, Oscillators, etc., under the category of circuits. Apart from the components and circuits we

must also have familiarity on the principle of operations and usefulness of Some of the essential electronic measuring instruments such as digital multimeters, regulated power supplies, Function generators, oscilloscopes, etc., These help us in trouble shooting the circuits and identify the faulty components Whenever the circuits that we build do not work as expected.

The diagram below gives in a nut shell the above ideas in the form of a flow diagram.

## BASIC ELECTRONICS



As a prerequisite for this course on basic Electronics, a knowledge of general principles of electricity & magnetism is assumed.

We will attempt here to learn Basic principles of electronics by the scheme “Learning by Doing”.

In this web based course, the principles of operation of the different electronic devices, measuring instruments and circuits will be discussed and a set of simulated demonstration experiments are included wherever possible for the learner to perform these simple experiments on his/her own and learn the concepts by “doing.” This will enable the learner to gain greater confidence at the end in the principles and working of electronic devices and circuits.

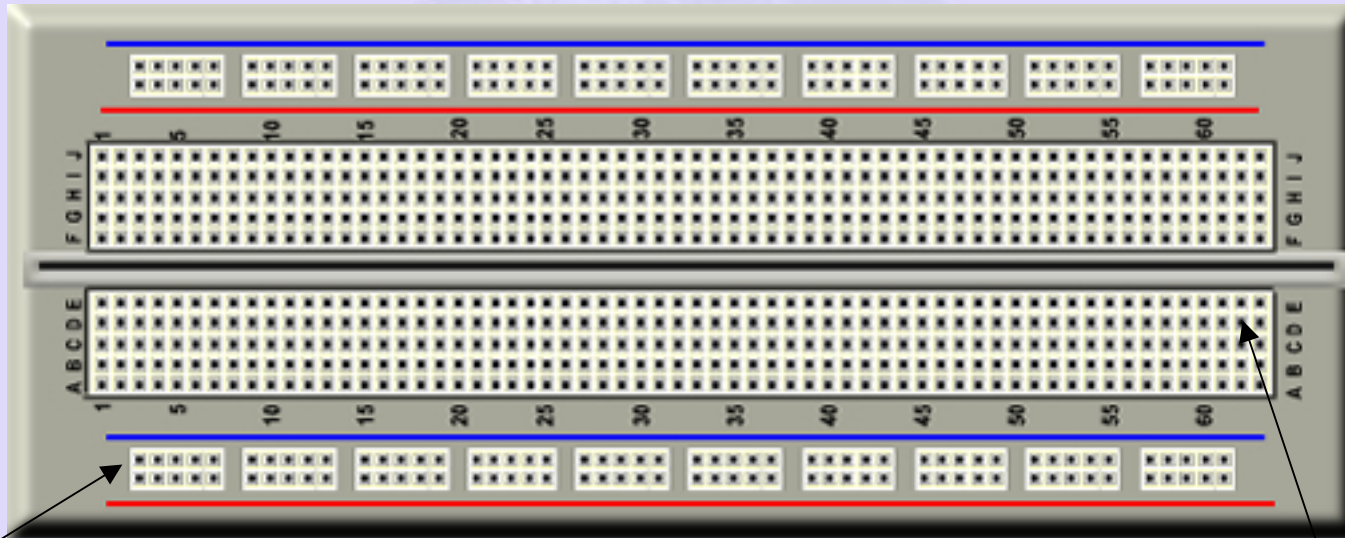
Before proceeding further, it is important to understand how the different circuits can be built and tested.

Invariably a “bread-board” is used in a laboratory for constructing the different circuits and testing them. This is very useful since here, we do not have to solder the different components. Soldering, as you know can be very time consuming. Further, we can reuse the components again and again, since they are not cut and soldered.

Let us learn below how we can use the breadboard for such applications.

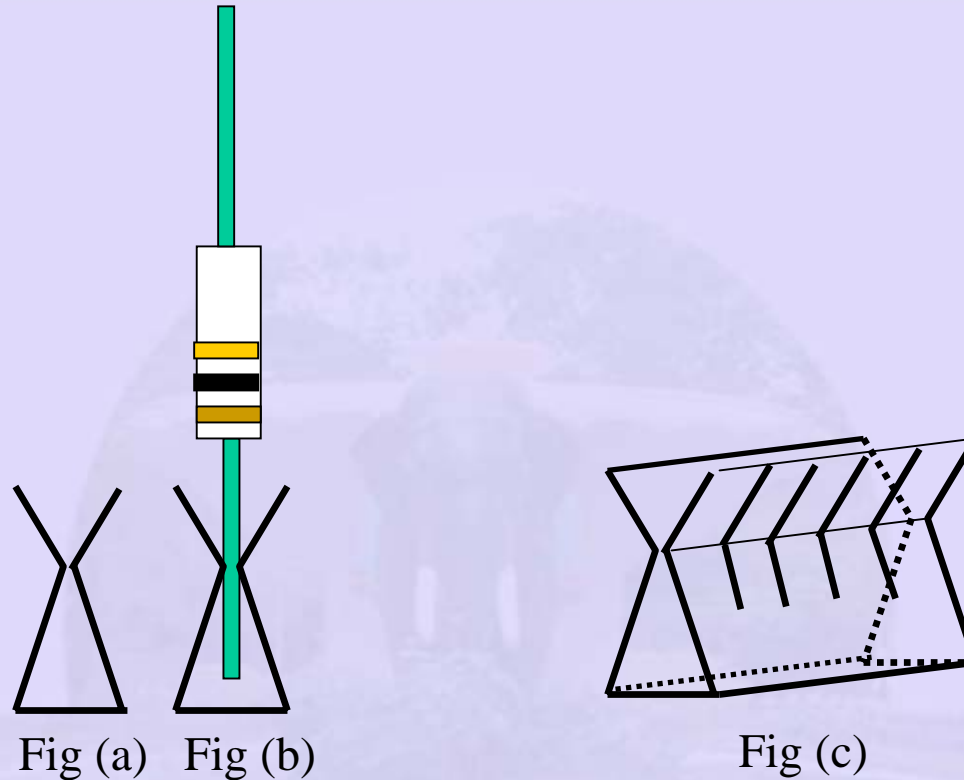
## BREADBOARD

For circuit preparation



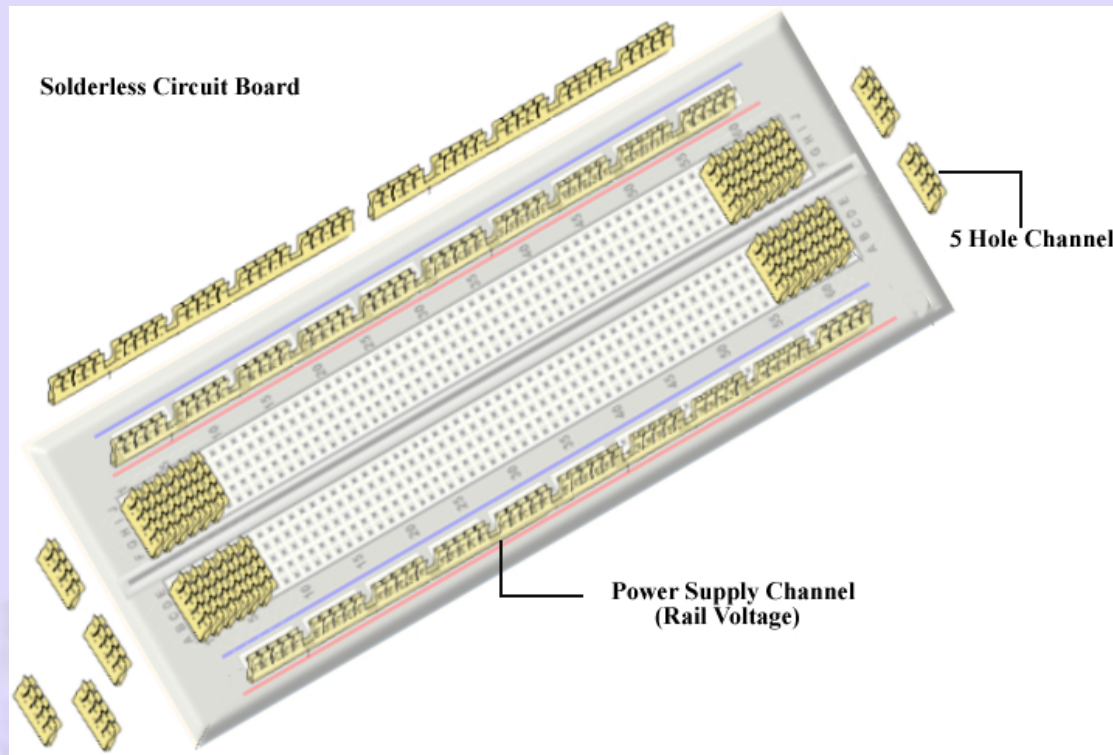
Power-lines or rail lines

5 holes node. 5 different points can be connected together



The breadboard contains a number of metal clips aligned beneath the array of holes so that when we insert the lead of a component (say, resistor) inside a hole, the clip grips the lead tightly. Observe the figure. Fig(a) shows a metal clip before a component inserted, while Fig(b) shows after the lead inserted. Fig(c) shows a clip which is beneath an array of 5-holes. All the five holes correspond to one node since all of them are connected together electrically by the metal clip. That means up to 5 wires can be connected to this single node.

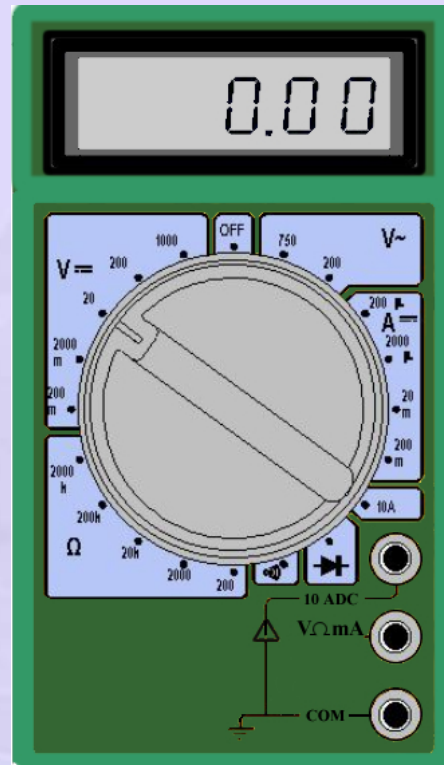
## SOLDERLESS BREADBOARD



How to check the breadboard for this arrangement of connectivity below. We can do that simply by using a Digital Multimeter (DMM) and a couple of wires. Insert the wires into the two holes between which you want to check the electrical continuity. Use the DMM in resistance mode and connect the two probes of the DMM to two strips of wires. If the resistance shown is Zero then they are connected. If the DMM reads high resistance then the two points are disconnected electrically (infinite resistance or open).



## DIGITAL MULTIMETER



A Multimeter is indeed a multiple meter. It can measure dc and ac voltages, currents and in addition resistances! In some recent DMMs we can measure even frequency, capacitance, etc. Two long probes are used to connect the DMM to a circuit during a measurement. The central dial knob is rotated to choose the parameter we wish to measure. When not in use we keep the knob in OFF position. ( See Figure).

[Click here to see the video](#)

## POWER SUPPLY

For performing experiments we need a Power supply which can provide the necessary power to activate the circuits.

The power supply we will be using here has the following outputs:

1. 0 to 30 V variable DC Voltage, 1A max.

The voltage can be read on a digital display panel.

2. -15 \_ 0 \_ +15 Dual supply, 1.5 A max.
3. 5V Fixed Dc Voltage output, 3A max.



[Click here to see the video](#)

