

Integrated Circuits, MOSFETs, OP-Amps and their Applications
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Lecture - 39

Experiment: Working with Laboratory Equipment: Power Supply

All right, welcome to this particular module. Here in the last module what we have seen? We have seen how we can use multimeter to measure several components, right? Discrete components also we have seen multimeter can be used to measure voltage, right?

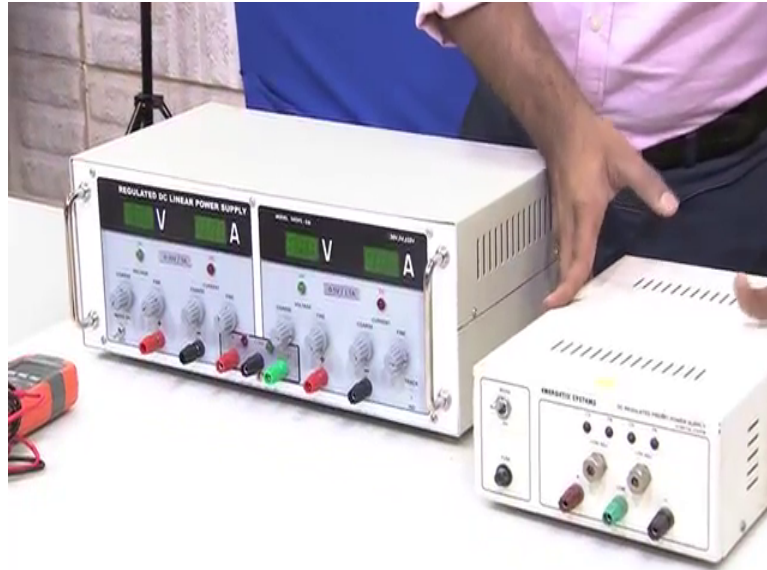
And we have seen a variable AC or variac, right? Variac can be used to change the voltage AC voltage, and that AC voltage we were able to measure using the digital multimeter, all right? Then we the end of that particular module we were also able to see the frequency, frequency we were able to measure around 49.8, frequencies around 50 hertz frequency is also called line frequency and the voltage was 230 volts, right?

So, the voltage in India single phase is 230 volts AC, and the line frequency is 50 hertz, all right. So, in this particular module let us see extremely important equipment and that is your power supply. So, again power supply can be AC power supply, power supply can be DC power supply right. So, what is DC and what is AC? If in a very crude way to understand or to answer the this particular question is, that the AC would have 0 frequency sorry, the DC would have 0 frequency while AC you can change the frequency, right?

So, when we measure the AC, you have 50 hertz frequency, isn't it? But if you measure DC it will have 0 hertz, straight line. That is why we indicate DC by straight line. We indicate AC by sine wave, right? We can also indicate AC by triangle, we can also indicate AC by square wave. So, AC alternating current DC direct current, right?

Today in this particular module, let us see this one which is the DC power supply, all right.

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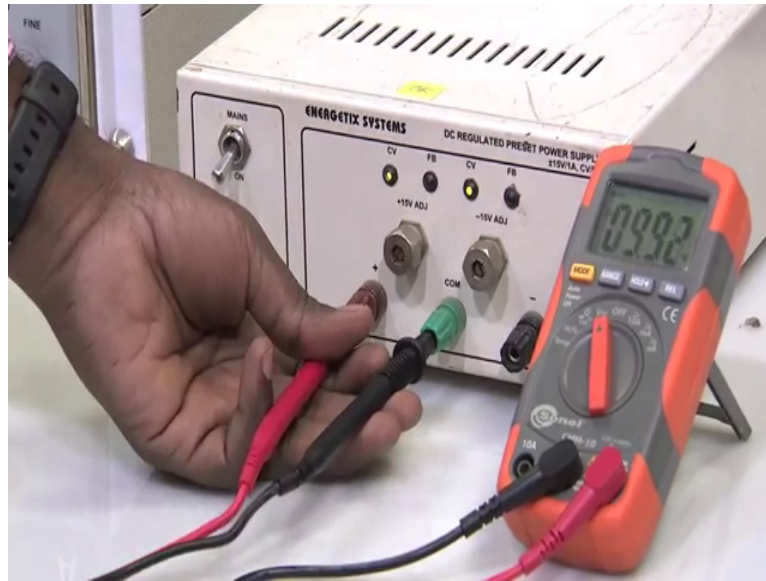
This is one DC power supply, is another DC power supply, if you this is fixed DC power source. You can you can change it little bit using this this is extremely old. So now, why I have kept both the power supply here, the idea is lot of universities may still use this DC power supply, all right? Or may use advanced version I do not know right, but those who are using this one it is absolutely ok.

Now, we have to first see what are the things written on this DC power supply right. So, if we see first thing is CV, then we have FB, then we have plus plus 15 volts adjustable ADJ minus 15 volts ADJ, there is a minus there is a common and there is a plus. This these are the things given in this particular, there is a fuse, you can see fuse here right, and then there is a mains. So, I have connected this right to the 230 volts AC and I am switching it on.

So, when I connect it, and I switch it on, you will be able to see the light here, right this led right. Now what you will see you will see how we can measure the voltage or what is a voltage right now, all right. So, measure this voltage again Sitaram is here to accompany me and he will be showing you how to connect this multimeter to the DC power supply so, let us see.

So, we have the DC we have the multimeter here, and he will connect it to the DC power supply.

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All right so, what is the voltage? 14.93 volts, excellent. Now if I want to change this voltage, if I want to change this voltage, what is the another way of changing it? I can change it using the screwdriver, right this is because it little bit old we can see we can see the change just try to change it see, we are changing it change it in a different direction please, yes, you see there is a change in voltage. You can change the voltage by changing the a knob right, but instead of earlier time we had to use the screwdriver.

Now, what is minus 15? If you want to measure minus 15 volts, how you can measure this is plus 15 volts? You connect it to black and common is same, this is your minus 14.9, you can change it to 15 by changing the adjusting the knob, and you get close to 15 volts, close to 15 volts right so, this is minus 15 volts.

Now, if if we know we have studied right in operational amplifiers 741, we apply plus 15, we apply minus 15. That is your bias voltage given to your operational amplifier circuit; however, how to you how to actually not is how to use this or how to apply this DC voltage to the operational amplifiers, or to any any circuit which requires the DC power supply. Then this is the equipment which is your DC power supply, all right.

Now, let us see newer version of this, newer version of this a newer version a better version of this. Here we can also see the value, here we cannot see right because we have to connect a multimeter here. We do not have to really connect a multimeter; multimeter is connected to just to say that whatever the value we are looking at here is it similar to

what we are looking at the multimeter. So, it will be close, but in this case the display is not there; however, you see the the so big, isn't it? So, big and is bulky is heavy is heavy to lift it. So, again I have lifted it is wrong, I have lifted it when it is on you see here, it is on you should not lift any equipment when it is in on state when the power is on. You have to switch off the power right, disconnect the equipment if possible and then you can lift it, all right?

So, point is these are heavy equipment why it is so heavy? Why it is so bulky? Because your trans the supply voltage that you are applying to this particular equipment is your 230 volts AC, 230 volts AC which I have applied right by connecting it to 230 volts. And I am converting this 230 volts to 15 volts or 15 16 volts. So, that means, what I have to use the function called trans equipment called or device called a transformer, transformer.

First transformer what it will do it will convert your AC to step down then give the AC which is lower 230 volts to whatever voltage. Then we have to use another equip another circuit, right? And using this transformer and the another circuit, we can convert your AC to DC what is the circuit we will see, what is the circuit we will see? For you guys or let me not let me not give you as an as another question or keep you guessing is a rectifier, right.

Now, there are several types of rectifier again. So, when I use a word like I said every time when I am impressing it very heavy on and each word, you have to go and you have to see what are kind of rectifiers; Because it may not be covered in this particular lecture.

So, when I say rectifier we are using rectifier what kind of rectifier half a rectifier full a rectifier, is there another rectifiers, are there right transformer, step down transformer, step up transformer right. So, here step-down voltage we are stepping it down right now this what AC voltage AC voltage sine wave, right? 230 volts AC, right 50 hertz frequency. We are stepping down to some voltage, and then still AC. So, we have to remove the AC component, and we have to make it DC. So, we have to filter out filter out, right.

So, you have to understand this thing, the point that I am making is this is the DC power supply where we cannot see what is the voltage, we cannot see what is the current right. So, when we cannot see what is the voltage where we cannot see what is the current what

is an alternative way we can use multimeter, we can again use the same thing called multimeter beautiful.

Now, let us move to the another one which is this one it is again bulkier, you see there is no improvement all the way. So, bulkier is more bulkier than the previous one. Because now we have two different sources, here you see we can apply through here, or we can apply through here this is regulated DC linear power supply.

If you see the linear regulated means you can regulate it DC it is a DC voltage linear power supply linearly increases when we increase the voltage we will see, but that does not mean voltage and current have linear relationship. That is not the case ok, because current changes depending on the load that you are using it, what you connect it? That current will change accordingly.

Now, so to start this one, right, let us first see each section, and then we see what is the role of this particular DC power supply; So, again I am giving a power to this particular DC power supply, and I given it to here. So now, we can we can switch it on, can you please switch it on? Excellent so, what you see? Here there is a 0-point current is 0, because there is no load connected, you see there is no load connected. So, it is current is 0, what is the power here the power is or voltage is 0 volts or 0.2 volts. Here it is 5.22 volts, correct?

Now, let us operator let use see only one one section ok. So, if you can still yeah you can see very clearly here actually. So, what is written here? 0 to 30 volts and 3 ampere; means, maximum current can be 3 ampere. If it is 4 ampere what will happen? It will burn, it cannot be operated, all right. So, maximum is 3 ampere voltage from 0 to 30 volts you can change it.

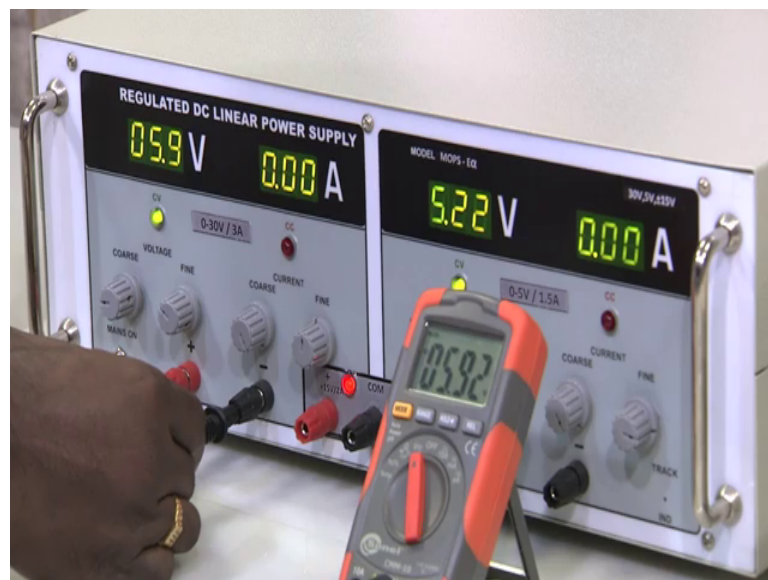
Now, there are there are this is what constant voltage, you see CV there is here constant current red colour right led CC. There is a course there is a fine there is again a course again a fine. So that means, that in voltage you can course change it you can fine tune it, you can current also you can course the changing or you can fine the tune it.

So, what does this course and fine means we will see. So, if we change the course voltage, you will see can you please change it see you can you can quickly see it is changing and you can get the voltage from 2, 3, 4, 5. If I want to fine change like I want

to fine tune, it slowly see 1.54, 5.5, 5.6, 5.7. So, course cannot give you this fine tuning again this tuning is the best tuning that we can have avail from a DC power supply, no, you can even get a better tuning, you can even get a better tuning. The point is just I am telling you about the knobs course knob and a fine knob, all right.

Now, what is that again? There is a red, and there is a black and, in the centre, if you see there is plus 15 volts 2 ampere common minus 15 volts 2 ampere which is similar to what we have seen earlier. So, let us first see just the voltage if you want to measure the voltage using the multimeter, all right? The 6 volts that we can see if you see the 6 volts sine we can see there is a 6 volts. So, let see what we can what the multimeter shows what is the reading, and when we connect see red to red black to black.

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Is it in DC power supply? 5.93, 5.92 right. So, the 5.9, 5.92 extremely close or or this is more accurate, because this is like 2 digit we can see further after right so, 5.92 volts, excellent.

What is the current? Current is 0, current is 0, how about the another one which is 5.22, can you see 5.22 voltage? Again, see how he is connecting red probe red one to red black one to black, red to red black to black. What you will able to see? 5.21, right? 5.21 very close excellent.

Now, if you want to, if you want to see plus 15 volts and minus 15 volts, similar to last

time that we have seen what we can do can you connect plus 15 volts. So, plus 15 volts, again red and the common which is your centre the and what you see 15.0. Now this is constant you see 15.0 is already there no need to change it, no worries, minus 15 volts just connect your red probe to, yes, green and you can see minus 15 volts. Already there, plus 15 minus 15, in case of operational amplifiers, you can use directly this terminals and apply plus 15 minus 15 volts. So, easy isn't it?

Now, what is another thing? Another thing is that at the same time we can use 2 voltage source, you see 2 voltages different voltage. We can apply plus we can also apply plus 15 minus 15 advantage of this DC power supply is that we can use multiple circuits, and you can use this as a source, you can use this as a source, that is the advantage ok. This is the locally manufactured DC power supply, but there are 2 advantages in fact, I can say the multiple advantages is one is see in this side if you see 0 to 30 volts 3 ampere and if you go to this side maximum is 0 to 5 volts 1.5 ampere, right?

Then you you can apply plus 15 minus 15 right that is the another advantage; that means, that you can use multiple circuits, and this is what your DC power supply means. So now, you all know so, one thing that I want to tell you is, if you if you do not know what should be the current knob, always make it maximum. Always make it maximum that will that will save your circuit, all right?

So, if you this knob course knob can you please make it to maximum. This is at maximum, all right so, always keep it at maximum when you are operating any circuit when you are using your DC power supply with any electronic circuit then keep it at maximum.

So, this is all about your DC power supply, one that we have seen is older version, another that we have seen is a newer version. The the point is that any version you use you should know what is the DC power supply, all right? And if the if the readings are not here, do not worry about it. You need a multimeter to understand or to check what is a voltage right. So, easy extremely easy to understand the DC power supply, all right.

So, we will we will we will we will stop this particular lecture here. And in the next lecture let us see the function generator, right which is the another one another part or another equipment. And that also we we heavily use when we do the analog circuits experiments. So, this is the starting which is your DC power supply, and next module we

will see the function generator, all right. So, this end of this lecture.

Thank you very much.