Enclosure Design of Electronics Equipment
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Lecture – 26
Fabricating with flat plastic

Having built these things, they have played a little on this while that was a different thing you see here this corners use like before it is edge pieces is what I was just talking to about.

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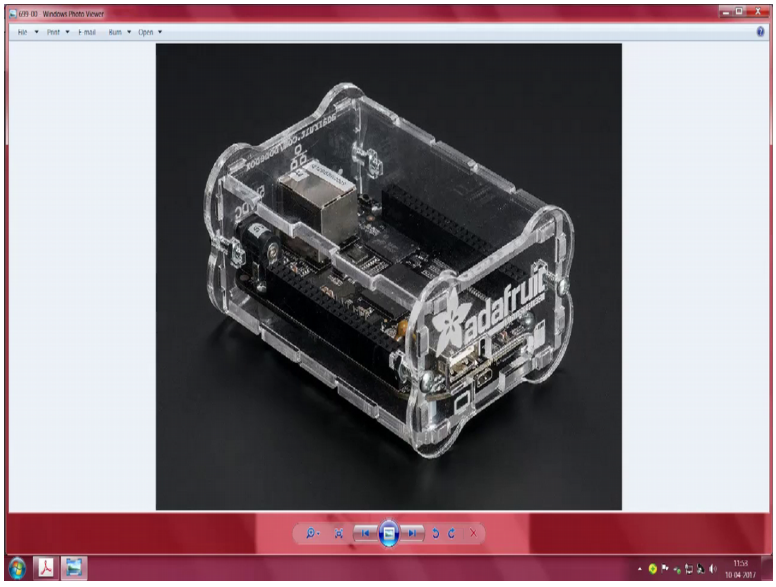

Do see also this nice beautiful shape nice corner rounded shape has two features one of them is rounded. So, chances of its chipping and denting are small end it looks like the classical dogs bone bones which with dogs play now.

So, we have, I mean we have made these things attractive by calling it a bone.

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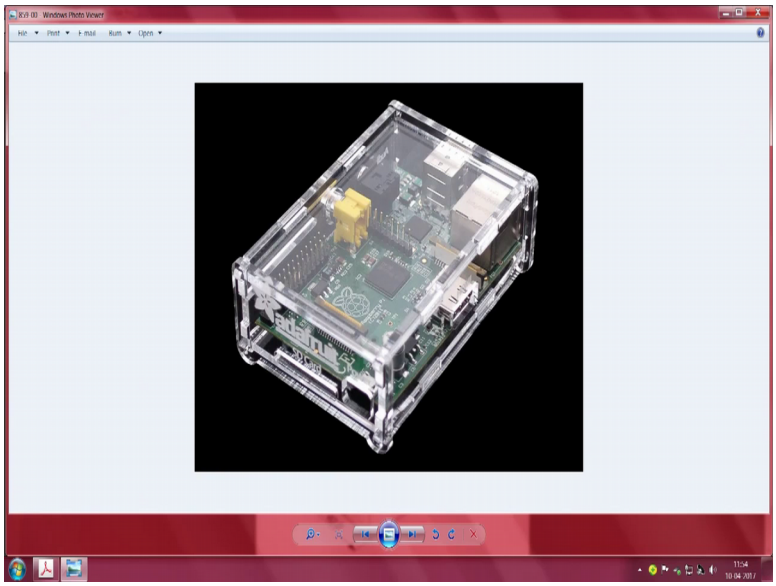

Even if you are a not having all these this side projections we have seen this know we have protection here, projection here and then you see all this the beauty of all these things, my suggestion is now its a small quantity and if it is already a hardware which is bot of the shell look for a an appropriate enclosure, so that you can do the system building somebody else has done this subsystem are the pcb for you.

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Why stop there, is it possible for us to make it little more rigid. Now if examine these things properly a little bit of detail in the corner is, but these two side members are made

out of metal the movement there metal you have some positive thing one of them is it will be tremendously what you call tough it will not crack stiff tough any other positive words you can use nothing will happen to it. At least you two of the members are made with this and then these other what you call a acrylic or plastic members are assemble together you have a extremely rigid and functional case and a little related to it is in case it falls if you see this corners and all know if you properly detailed corners chances are it will never chip.

So, we do not know nothing about bread following and the buttered side falls first I do not know if it is true or not here, but the thing is even if it falls they have made sure that only this corners which are all metallic face the in here you see a little closer have seen know just another view of the same thing by the same company which makes it beagle bone. And very highly appropriate interesting thing is all these connectors and all maintain their position very well and then you see here this left and right member have four mounting holes.

So, you can attach a panel and make it as good as you wanted and you see when this small detailing here this step here it this the little over by one thick I mean a two thicknesses thickness of this sheet metal and thicknesses of this by which it holds all the parts together and instantly this also helps in having access to the connector on the side. So, that in case there is a shell which projects out it make sure that it sits properly I had just other views about it.

See, now you see a little from the top you have full access to anything you want here if you have a connector you can have when and just next to the connector you have that opening on the top. So, then it is another spectra strip right angled installation displacement headers directly goes into this then you have a USB socket here, similarly you have various other types of you know I do not know it is one of those computer connectors.

So, you have here variants of this whole thing can you see well that one has a sheet metal. They have tried to build this here using starts of a acrylic.

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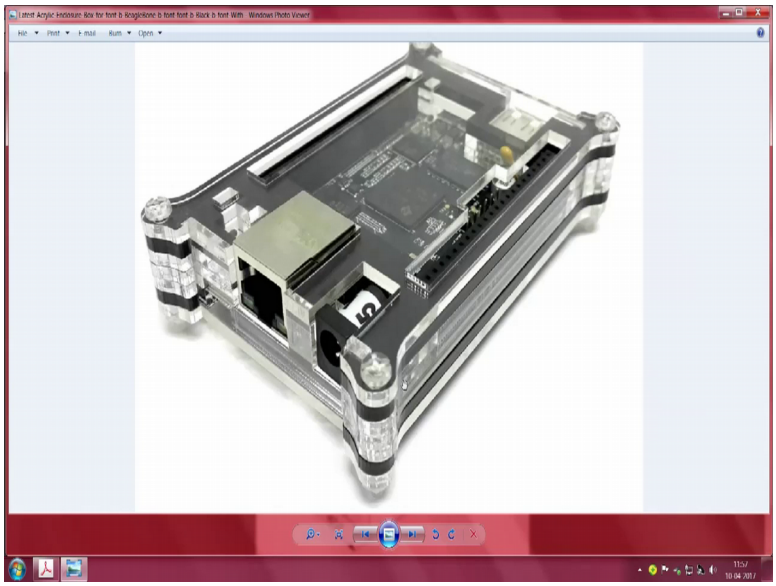

So, if you have a flat acrylic sheet very much possible for you nicely to build up all these thicknesses seen that and then you see what I would call genius thing is you have a power supply in I do not know it is a 5 volts or 6 volts or 12 volts all these connectors and all come as part of the original printed wiring module that you have about from them. And then just to accommodated small thickness there given a still big opening. So, that your cover you can open the cover and then happily things it there without any hindrance.

So, if I keep getting trying to get closer and all that you see here how nice these things are.

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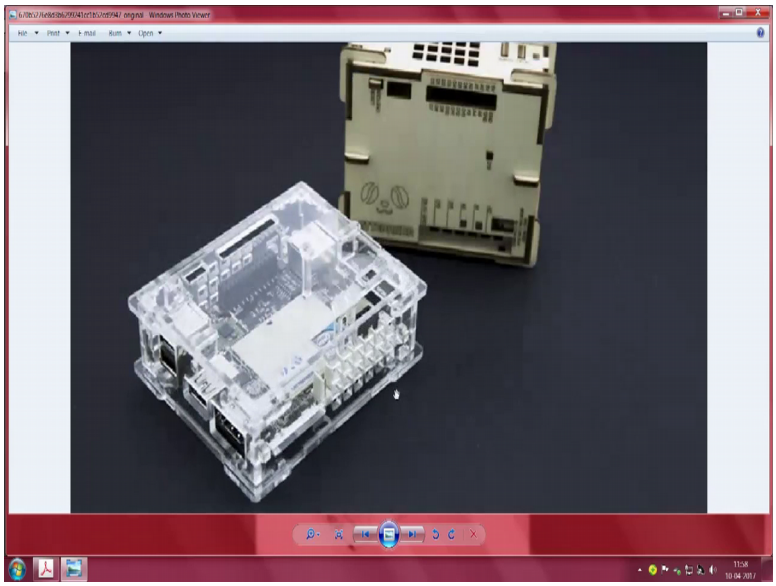

Now you may appreciate the one (Refer Time: 05:33) just talking to their the front and back panels are the over hand and in this case know you have this, now you see this you see this beautiful corners whole thing a still a plastic material most likely it is an acrylic and then it also has reinforcements in the corner, it has these projections and it has all this and the miracle is in the end it is going to fit as of its a jigsaw puzzle.

And a one particular sequence if you follow, if you have a jigsaw puzzle in particular sequence if you follow you remove the last piece and one of together you can take it a parts similar taken put everything together and put the locking piece in place and you have a rigid board and we are in modern times. Often the file is available for you to download, if you have the file you can cut it in rapid prototyping. I am sure some of you at least for waiting for this we needed to make the small spacer. You would have seen this in the video or you will have a chance to see it in the video, we will see here see this spacer this is part of a shoe.

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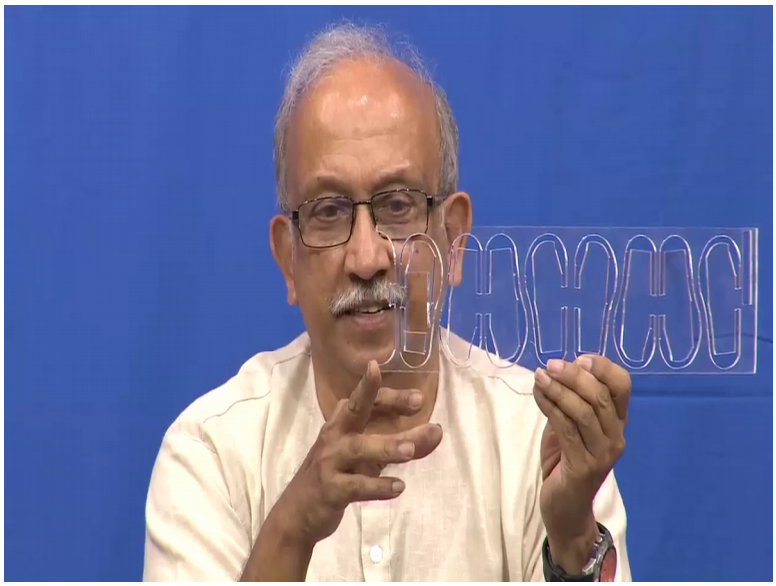

So, we have printed circuit board which goes in shoe and then we need the some top and after that they various things like a their sole and in sole and all that is in one side we have an in sole other side we have a sole and then the shoe upper and all is stitched in this. This is very convenient way of making first of all we can always start with the few pieces whole thing has been released from here, first piece releasing is no problem and then if you have to make a cad drawing making it left and right symmetrical is no big deal it is always a mirror image.

And then you can happily release these thing you are seen this no we have fit here and so on that is advantage of new our packaging all its not correct to use it as a word called technology its now accessible. Just like a inkjet or laser printers is available for you eventually we expect that this laser cutter also will eventually be available. Features you can see is its optimized I have one set of shoes here another set here then by turning it over the amount of sheet used can be optimized. Thing very much related to is this whole thing it is not done by three d printing instead it is made by laser cutting of a thickness. So, if you keep going down further you will end up with this beautiful, enclosure.

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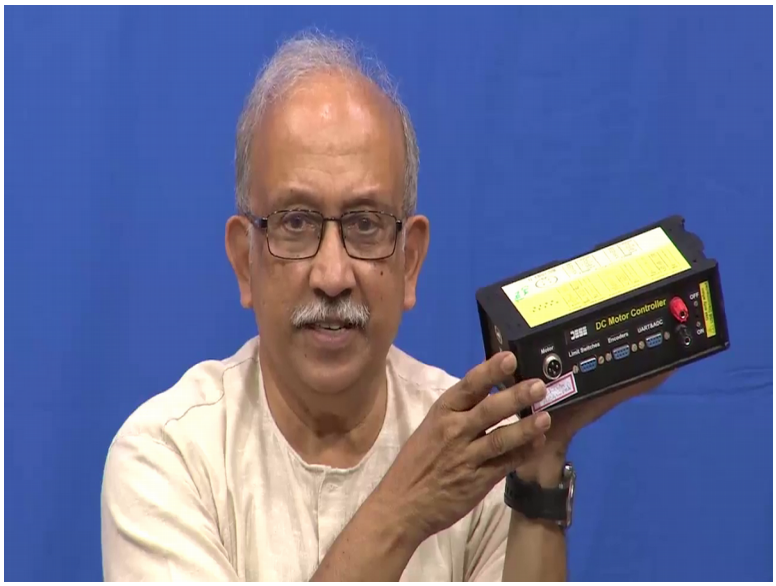

This is one of them which has been made by our students in our electro mechanics lab. This one is a acrylic sheet you can also make it as I said make it in polychromic or there are other materials here they main feature being the whole thing has been done by laser cutting you can make out it does not look like as a fit was a made of a sheet metal thing. I will not risk opening it a very risk opening it I may damage it.

And then you see the conventional hardware including a connector which goes to the motor and including all these various types of d subminiature connectors and finally, the power supply part of it have been mounted on it as if it were a what you call professionally made device and then related, this is also all this is instructions on how to mount this things and then are such students have been very very good in then they have been able to make these things very interesting.

So, I have a beautiful enclosure here made with all the attention to detail and then you how may it is a wonder I cannot do it, I am happy and that I can only talk about it and students now have taken it to the next level. Please keep looking at it, please keep looking at it in while I will see whether I can bring something else.

Now, I will come back and I will show you a few other materials samples that have been made here, color is different.

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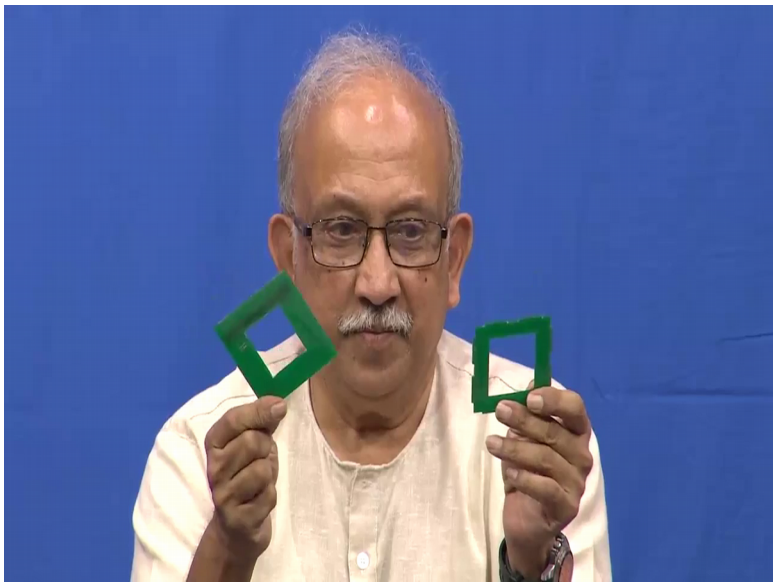

It looks insignificant, but the reality being this can be a filter, you can take the usual led red colored filter or any other items and do the same thing you have a front panel which can also form part of the final display we would like to make. So, all this nice small details and your basic thing will be ready. I will now see whether I have some more pictures here.

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Do you remember this is I shown this to you in the initial stages due to enthusiasm of our students they have tried to print it and then tried to make it out of rapid pro typing. So,

then it is nearest to the concept, but let us say in the beginning you wanted to write a first model to see whether the total volume and all is correct this whole thing could have been easily made in plastic sheets. As part of this plastic sheets for example, if you can build different thicknesses here you can have thickness there in the thickness here and instead of fully trying to make it of full organic shape, you can just try to round of the corners and you see here we have this small plate here this can be probably made with an acrylic material with openings and if the LEDs just come and touch the surface the color will come through and the different colored materials can be used for the top and bottom and. So, making it look not so great by making it like this using our laser cutting technique this could have been easily achieved because we have full white colored acrylic is available or even some variant. So, PVC are possible.

Similarly we have orange and other color of acrylic. So, this whole thing could have been built probably in 6 layers bottom three in one layer, top three in another layer and then round off all the corners and eventually why that 6 layers is while this is a top layer this next layer will contain the details of what looks like a front panel. And then below that the next two layers will be used for all the electronics that come there. So, we have chance of working an all such items. So, that very easy for us to; seen this.

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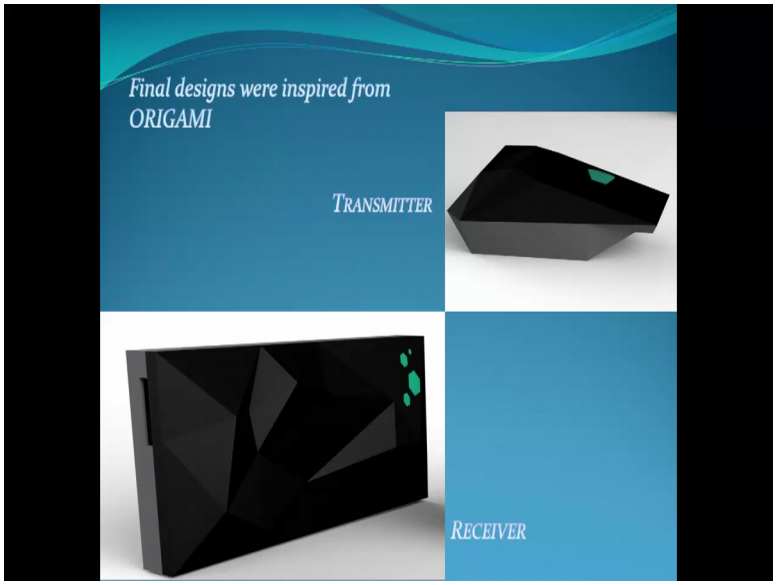

So, as somebody were to make a unit like this it can be just a hobby or it can be a starting point for an actual product this as if you see several things like our table fans and indoor

coolers all of them they all come with remote. It is very much possible for us to make the initial modules using build up or assembly together of plastic sheets and in case you have a laser cutter it is easy otherwise it is available online if you can make a file and uploaded very easy for you do make all these items as they come together.

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You see here an electromechanical device which was a developed by us for trying to carry out some analysis on drugs and something which inhibits a growth of one type of whatever pathogen we have there. So, it will be probably at all claim to call it anti matating for it is a simple antiproliferative device the device itself being. However, plate here in which we have all this small wells and then we keep a hybrid seed in it which is sensitive to one particular compound that may be present in the field that is a given fed to it, you see all these small cups and all that know are all made in plastic and this main carrier has been made in stainless steel.

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Then you have here another plate here which has some homing and king data saying it will adjust the what is the pitch of these things and so on. The carrousels will can be interchanged and this carrousels in conjunction with this rotating device we can carry out scientific experiments. Why it is being shown as here is in such cases what are a spoken to you makes sense the controller can be made using all over plastic materials and this one is a dropping mechanism which is used which is made in sheet metal. If you see the base material sheet once again if you see all these things various types of sheets have been added here this is only a rough prototype, this is not a production module.

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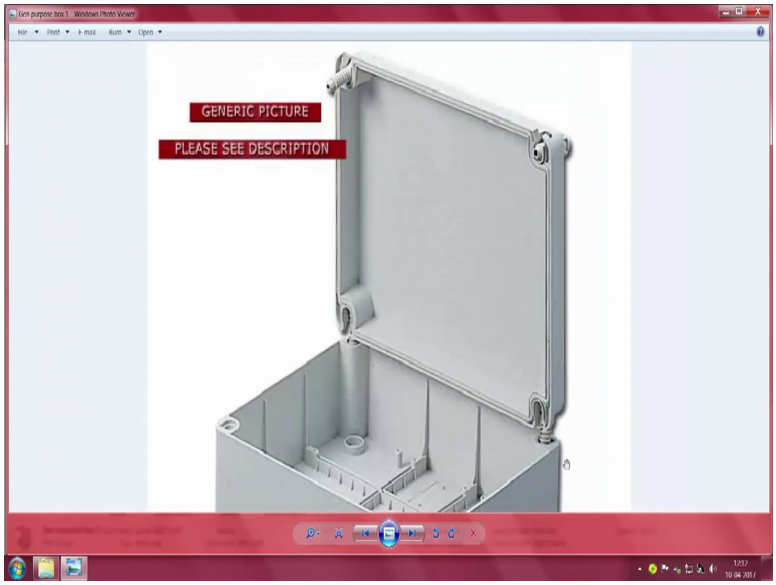

You see here in case you look at them market. If you can think of something remember the somebody else have, so would have thought about it and probably it is available for you for purchase. So, you have the standard enclosures is several the other detailing that I was trying to talk to you the because you remember this corner when I use beautiful corner and something somewhat related to this. This is exactly what know it is trying to tell you in the first initial stage if you want you can make all this things not impossible. And you want to come to actual producible items you have a rubber gasket here, this rubber gas kit sits flush with this other surface and then you have a practically water and dust proof enclosure.

So, if you can look at the internet most of these things are probably available to you see this here, slight bit of detail.

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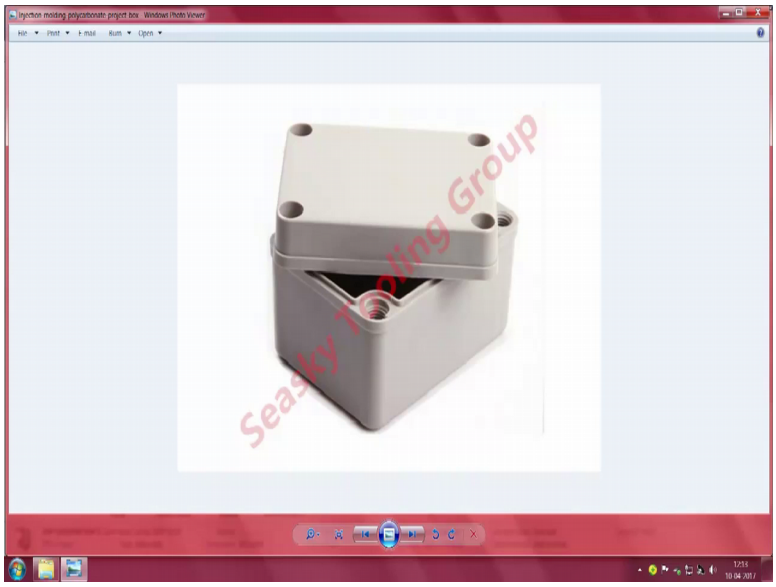

There is a threaded portion here and then there is also reses on top. Something you would like to see is probably there is a small step here which goes on correspond to this and that will make sure that to one level you can make these things waterproof. So, I will see if I can go out. And look at a few more items which I had kept for you, yeah I have them anymore detail will be very confusing.

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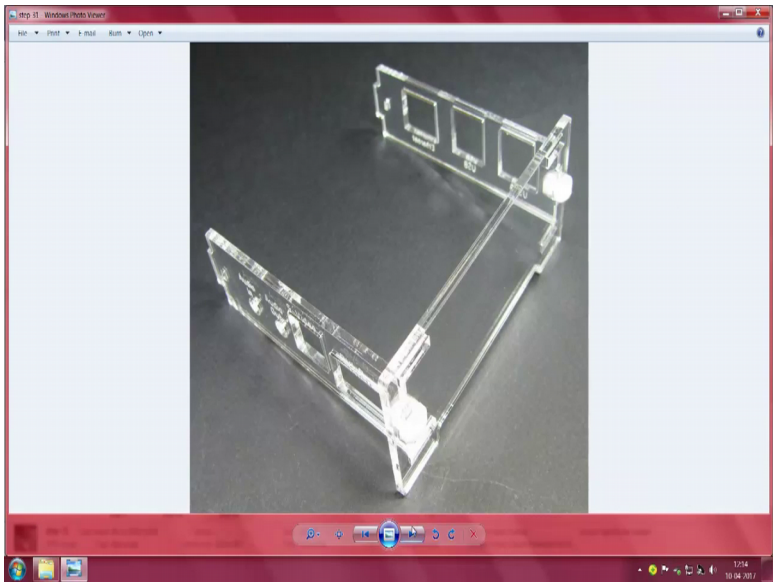

Observe this a little carefully instead of just directly trying to put all the parts together by just overlapping with each other a little bit of as small hardware detail has been added here in this corner this hardware detail a some type of a fashioner its of course, patented it will ensure both of them sit together. You seeing this it looks a little like a clip main feature being inexpensive.

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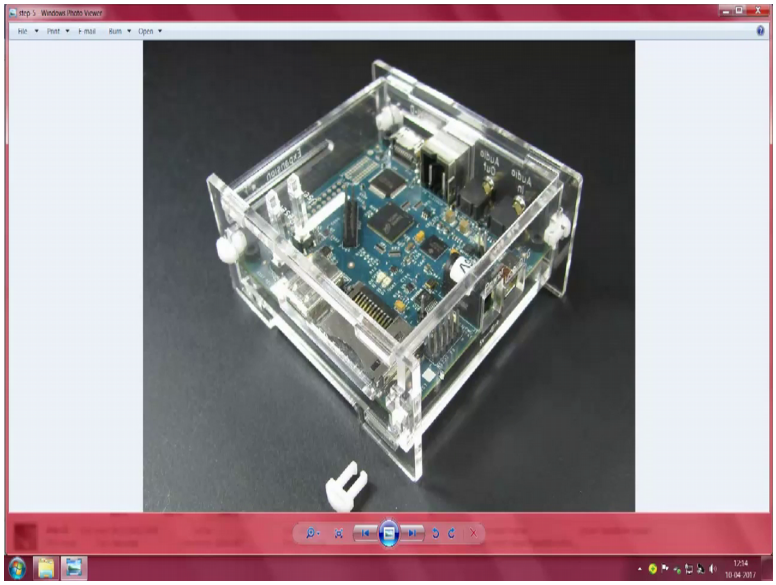

So, if you push the clip inside here and this as a both vertical and horizontal thing you see how it seem to hold the other pieces together all it needs is a small step inside and its

snaps in place. And if you search around in your local shops you can probably find all these fashioners to put them together or to help you concentrate on your basic electronic design you should probably buy the enclosure which comes with these devices when they come, seen this beautiful. Everything know seems to be getting better and better.

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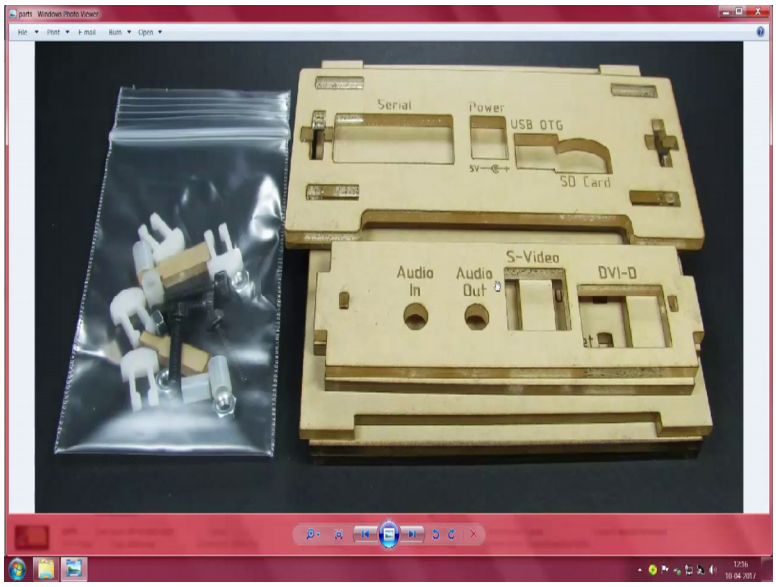

So, many of these things are there, they all come in a kit now you notice something about this kit. As it is supplied it is cutter by laser cutting and you still have the protective sheet on top of it. So, most likely quite possible for you can continue to use the protective sheet and continue there we are can right things are if it has been next carefully probably things like this audio in, audio out, (Refer Time: 21:55) video, dbi and then the serial port power, port and all those thing are already tagged and ready for you to be used properly. So, I will just keep having a look at in. I will just try to pick up one sample which I have showed to you in the video, need not explain what it is. If you are seen the video you will know what.

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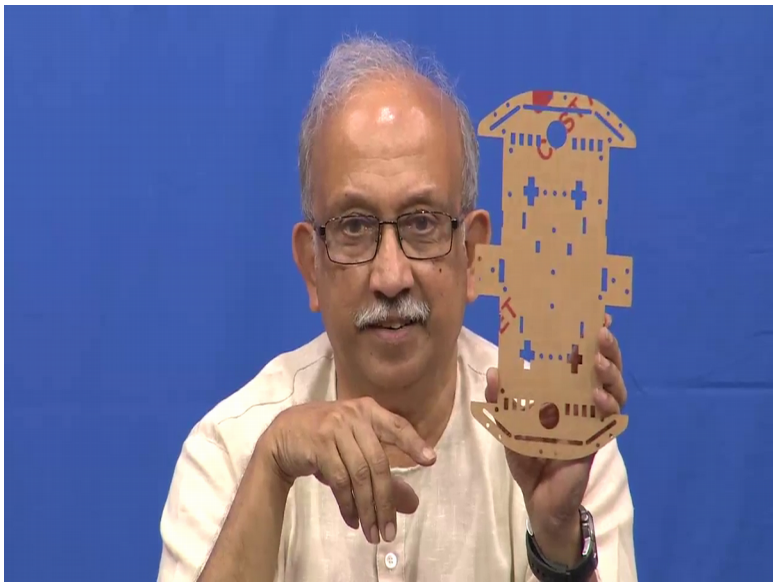

It is this whole thing is in acrylic sheet and it comes with the backing sheet and then various openings and all have been done and then you have this place for all this projections. See the thick being the main advantage being you can do whatever you want to do with it, so some of our students have completed they have started building this whole thing.

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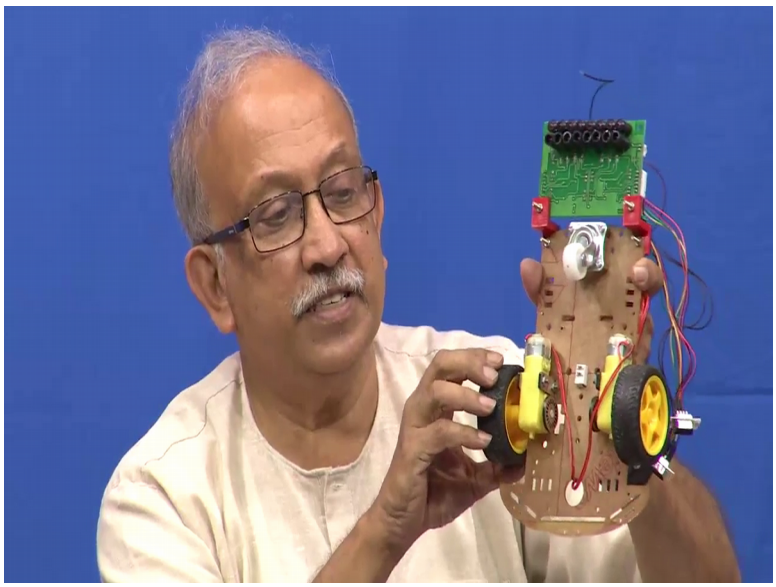

See here we have a when I think you know better about it what this things are. So, we have an encoder, then we have a motor, which has gearbox and then there is also a caster

wheel and then they have to try to put some sensors and the moment you have sense as and then you have a receiver the little tube and all this know you know what it is. It is a beautiful technical game not for geeks, these days know anybody plays anybody can play with these things.

Hopefully to prevent you from getting saturated I will stop here and then in the next lecture I will try to continue how to create this object. So, far it is all about talking about how we assemble these things together we have a few pieces and then I was talking to about two or three things one of them is saying you think about the final enclosure, how much space is required, if it is the standard enclosure probably it already comes with a standard; standard hardware comes with somebody who has worked with the whole thing and with an enclosure is available of the shelf.

If you need to add on anything make it a little bigger. So, you can always do it by techniques I have shown if you want a really weather proof enclosure you need to go to the web several people supply this enclosures to most known sizes and shapes. Only disadvantage it being has things stand out it is not as if the last design has been made always you know designs keep coming and then things have started making smaller alternatively there more complicated hence a little slightly bigger in enclosure or a different aspect you have a different system. So, in the next contact I will try to see whether I can show you how to use a standard enclosure how to select a standard enclosure and then how best we can make it such that it suits your application.

We have little problem know what comes first you learn the technology and look for an application for it or you dream of an application and try to make a technology for in both are there they run parallel all the time. So, sometimes we make sense otherwise things like this beautiful glasses my hearing aid my dentals including my watch would not have been possible technologies is there was being used elsewhere now the whole thing know comes here.

So, these days you can probably even a make a watch, in fact we have a sample program which can with our 3D printer a fully working clock can be printer in one go. You make everything and then all it requires is probably little pendulum and some motive an electric motor and the whole clock keeps working.

So, thank you let us meet again the next class.

Thank you.