Enclosure Design of Electronics Equipment
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Lecture – 55
Detailing with CAD

If you remember last time I also had a torch cell, which I called cell and kept it on the desktop. Now I will see whether I can start a new design completely, and then say here saying import that whole cell which I have got here to make my thing easier in this point what I will do is, I will just try to.

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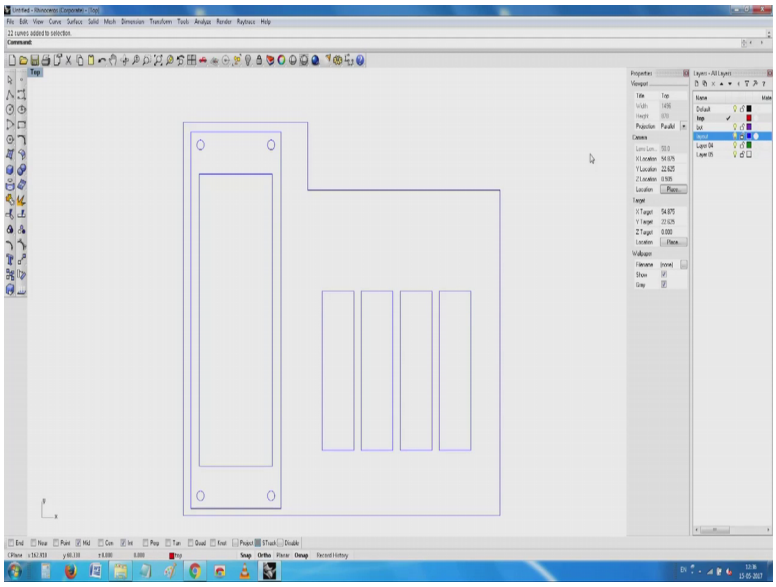

while this is a full fletched3 d drawing, it is not that useful for me in this case just like that I will make a curve which is approximately about this much size. Say it is intentional I am just making it a little offset. So, that I will not and then I have not maintained the dimensions, this is typically the dimensions of my cell. I will not delete this point understand I have a cell here only thing is the orientation is not known and then there is no polarity about it.

Similarly, I will also come and insert the 2 into 20 line display. You see here two components which are very critical which have created on the fly, I have them already with me. So, I just now need to find out what is the voltage with these works, traditionally things were being all used at the either 3 cells or 4 cells. So, I will just copy

them at 4 places this is where cad helps a lot. So, I am already on my way, I have the power supply I have the display now I need to decide what to do with it. So, I sir can you please show me this you see here, it is a like a box absolutely no problem and then when I open here the core of it is you have this cells. Cells are available two things one is the physical dimensions and all another is related to the power that they carry, that is the voltage and then the milli ampere hours that shows the total energy they carry and then little about the chemistry and so on and so on like this. So, if we are already on our way two other things, which I have created including the display, and then I have what I call, power supply. So, it is for me now maybe I will group the whole (Refer Time: 04:00).

And lock them together now if I move one, the other moves absolutely. Now it is for me to decide where to put the p c b, where to make an outline how much space we have here.

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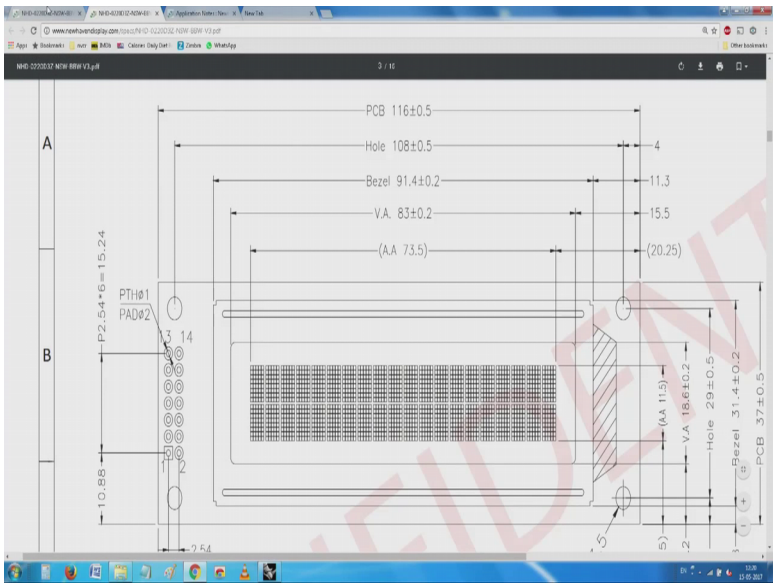

This is where when I go back to the wish board and those items, I already have an example of how much of the we use the word real estate or the food printed has how much of it carries.

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So, we and now where to get this information all the components information is usually available with the supplier, and depending on the novelty I mean the intellecture property and (Refer Time: 05:08) of the application you have things which are available here. So, you have these LCD displays from all sizes. This particular one is something which is used by hobbies. Moment you have these things you can now go back start your construction. Having done this now I will see if what else can be done one of the first thing is; obviously, you start with just like you have done earlier you started the nice cute rectangle probably it is about the outer thing and then if you make it here one of the first things you will notice is big, and then I would write to dimension, it I will say the dimensions have been set not bad.

Now, go here and try to I had just the dimension properties, in this case default I will try to default I would try to make yeah (Refer Time: 06:35) is fixed (Refer Time: 06:37) they have given one, I will make it 4 millimeters. So, that we can see it (Refer Time: 06:42) you see here end up with something its 200 meter, 200 meter means no problem this is about this much you should understand this typically this length has 4 inches or 100 millimeters. So, this span you can measure on your own it varies from 200 to 250 mm. So, if I take it about this much. So, I have a product which is about so big and then. So, wide now is it that something we do to say how to compact the whole thing. This whole thing is a place where you know we try to layout the equipment, layout array geometric facility.

So, what we do here is now I try my best to see what I can do with it. So, that is where this cad helps us a lot. Carefully watch what happens to this 218, I would like to make a little smaller made it one 75, by just dragging this power supply cells inside. This is the beauty and the advantage of using cad package. Luckily in this case we have space; space is not a constraint anyway. Since space is not a constraint you can play around very very conveniently with it the moment the space becomes a constraint we will come back to the earlier, I think I do not know whether it is a raspberry pi or r d a no bigal bone boats that we have shown you its tight extremely tight there you need to now do something about it well it looks nice for me let me go a little faster, what I do is, I pick all these items and then you see here the total I do not seem to like that I have reduced it I have reduced it drastically, now I will go here and see what best I can do with these things.

see here slowly I am trying to make them as compact as possible, what started as something. Now you see here my constraint is 116 m m is the width of the device. So, I still have almost if I leave around say 10 m m all around, I end up with a printed circuit board typically about 100 by 120 m m it is a little squarish. But then can I try to do something else with it why should it be squarish. So, why not I now try to constraint the width also, as I have told you about a 100 m m maybe more convenient for me.

I just leave it like this, I have done something here and then tried to make this dimension more convenient for me. I will just allow me to just I mean just allow me to I have a beautiful thing, which is about 100 by 130 m m. Except the display does not go inside, now minimum thing I can do about this is place see what I have done. I have offsetted to a convenient place where my this display sits reasonably sluggly inside. So, I have a little bit of gap here, now I see whether the same gap I can maintain here.

Now see here, I have a outline now which is little more easy to handle meaning I can handle it. Here as I told you about little over 100 m m, I can handle then I have a length here which I can now maybe I can make use of it. Having started at this point I need to now populate it onto a printed circuit board. So, what I do here is, try to now construct an outline of a printed circuit board with it. This outline is the one that needs to be carried into the next level of EDA packages electronic design automation packages. You see here we have an outline, outline has been stated with having taken all the components together trying to arrange them in a reasonably logical way. Just out of convenience I

have put them into I mean rather on the fly, I have put them just reasonably arrange them I will take a more practical example next having done this now we come into very nice concept of layers in these things. Advantage of layers is this whole thing is a default I can use it as a construction layer alternatively, I copy these entities duplicate them in all the other layers and start building up things around it. So, in this case it is in a layer called the default.

Now, I see if I can make another layer here which I shall call top, and then I will make another layer which I shall call the bottom. I have a default layer then for convenience say this layer 3, I will change it to layout or it is a construction layer, and we have a further command which is common in most of the what you call packages, this concept is layer is common this being a simple drafting this thing remember this layer is little like the overlay sheet, which they use in creating all those cartoons and all that. Usually at the back that whole scene is probably painted and kept fixed, and then on top of it they made transparent sheets which show characters and then which show characters with a small amount of movement which is different from one to each other. So, when they keep them one on top of the other and try to photograph them, the background does not move, this things move and then you can move it along like this is the original concept of how layers came about.

In the case of our cad packages, it is just an attribute of the entity. It is not actually physically on a layer there is no layers as such, it is just the it is an attribute and then it is all written to a database like structure and then depending on what you select here we can change the colour of an object, we can change how it appears in the case of a rendering and in the case of genuine and solid packages I mean solid modulers, other properties including its density and then other things can be included in it.

So, right now I will move this whole lot and I select this this thing changes, here you have seen that the colour I do not know my I hope your display is as good as this, but I suggest you go to especially this is I mean taken from one of these things, you can go to anywhere try to purchase a proper package and then one of the first thing you will notice is the colours of all these entities have changed. Now I am trying to building up a top cover, I noticed that I need this outline cell lot. So, I will take this whole outline and first thing is I probably need to group it or convert it to some other. Something has happened

you have seen here what I have done is that layer which I have called the layout layer I have switched it off.

So, that when it generates I only have the outline of the package. So, again this outline has two components one is it also represents a bottom cover and then we have the top cover attached to this. Now I see just to sort of keep your interest holding on to this how best I can demonstrate this. See right now what will be visible on the outside is; obviously, this small vessel part of it the display part of it. So, what I will start doing it is I will start drawing a line and then one of the thing you will notice on the extreme right side, I have selected the layer, on which I will be working in this case it is a top layer and again I switch off the layout, you see here something which represents a little like the boxaway stucking about has appeared here. Seen that no I have a cut on the cover it is not yet a cut it is just an outline to show, where I have to make an opening.

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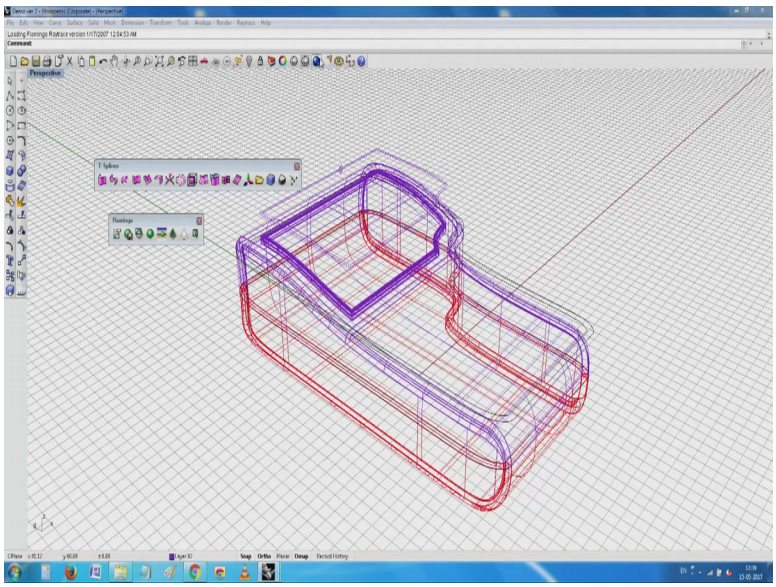

So, to keep your interest alive I will now, bring you back here, you have seen this this cute structure has been built up from the approach which I have been trying to show you earlier it looks nice.

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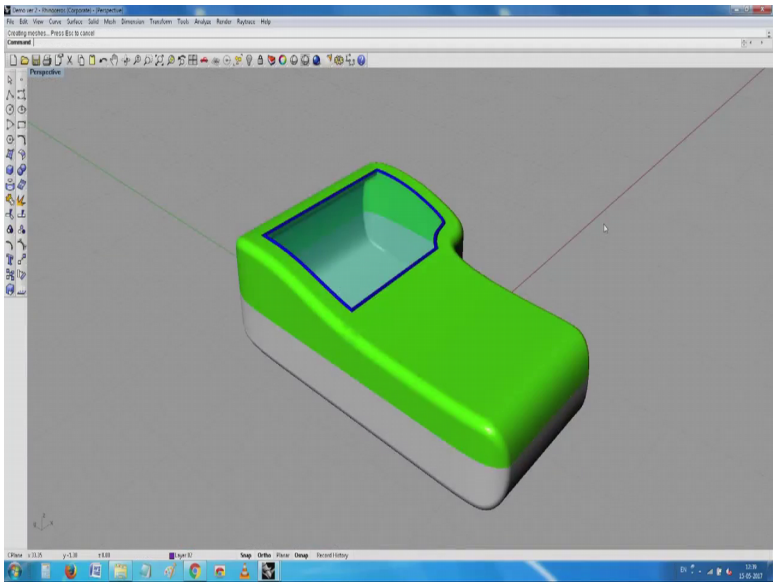

So, right now because of the what you call complete resources, I will just switch off this go back to my old what you call drawing which I have started. So, I have this what you call some display like thing and so on now I see what best I can do with it. So, I am making this thing little more presentable for this the common comment, they use is the filleting comment. You see here what started quite well at that point nicely know I have got, something which is interesting that is all I can tell this part of it, is it makes it the sharp edges have been removed I have got something which we have a the corners have been made a little rounded, it looks crude it still does not have that beautiful thing which I was talking about. At least we have started here display is a little bigger than the place where I am holding. So, going back here this represents only the top cover because I switched off the bottom.

Now, I will go back to the bottom cover you see its still, and start working on the bottom cover switch off the top do the filleting again, its (Refer Time: 25:50) it is difficult for you to stay focused, but kindly please stay online we have this bottom whatever you can call it to make things a little faster and things like this.

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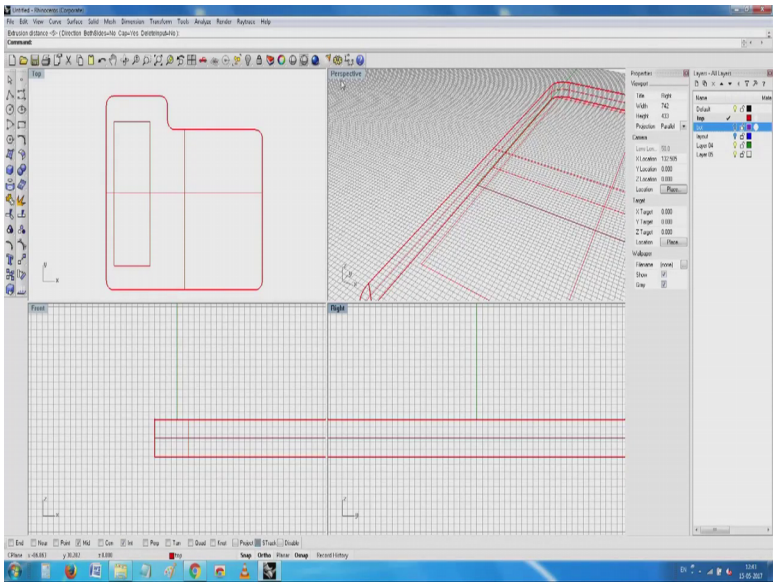

I will go ahead and just sort off you know speed up these things. What I am trying to do is make the whole thing into a one single line. Now I will go to another view and see what I can do with this line; oh I think yeah you see here first time you will.

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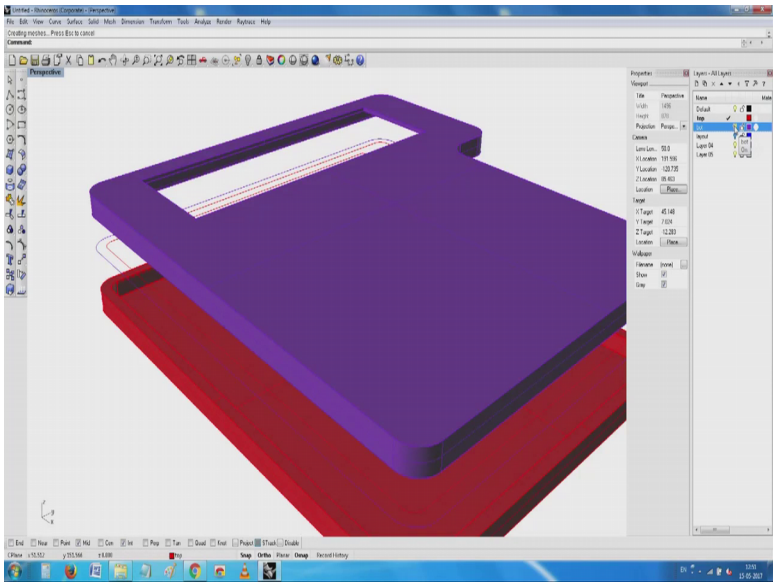

Now, notice that I have an ice solid here, I have a cute solid here, it looks like a little like a sponge I started with an outline which is taken from the dimensions which I have done, then after that I have converted I have tried to trace a small line with it.

Now, we see how best I can what you call play around with it. This being a simple surface modeling software, it does not work very well as well as I would like to have. But then the more sophisticated expectedly the salt semens and all the other bigger things have comments like a shell how do you create a; if you have a what you call small flat area, you can make it into a very convenient shell in this case I would do a little bit of circus.

So, I will try to do I will anywhere repeat it, because it is very painful for you. So, I will stop talking and then see what best you can get out of it. See what I have done I have offered the curve which I have used for creating the original base after this I now go to the side then create I have also extruded it made one more object, it is a little see what I do I go here similarly I go here, try to show you this look more dramatic you see here when we turn it over it just look like a piece of a sponge. Now after I play around with this other solid operations typically I think called a Boolean difference, I take this remove this piece from here; see what has happened I have got a tray like thing with other thickness.

I have two convenient oh I think I need to go to the other view just pardon me for this. Now in this view one of the things you will notice is seen this, I have a box cover which already has a thickness. The red part of it I can use it as the top or I can use the purple part of it as the top, but in this case since it is there I will just see what best I can do. When I did the can you see here what I have done is, I have used that display opening as a solid which I am going to Boolean with this and make a cutout.

So, eventually this will be my I take a solid here, now I do the Boolean difference between this object and this object and you see I am in business. What started as a just as an outline slowly is now going into what all I want. Now since I have already started with this what you call layer concepts, I have an ice bottom plate which is a little like what I started with, and if you remember the 4 mounting holes and on the batteries. So, if I now go and un hide all the things sorry, I removed the cells you see here that as we build.

Slowly we have come on to this beautiful calculator like object which on the fly, I tried to create I tried to be little slow. The same thing can be continued until you come into

thus almost organic forms and if I try to render it I still have a little problem, the corners do not show as well as I want.

So, we need to play around with how to catch the highlights and then how to illuminate the object, how to give a texture and all that which I should try in your next session. But what you wanted to do now is in case you have some exercise you would like to do, collect all the components that are likely to be required for it, and if possible if you have the catalog you can take them from the catalog. If you do not have the catalog you still can measure and then try to insert things, you see little problem with our packages this original was probably made in inches this one represents 3 pin regulator like this as a student exercise I started making it.

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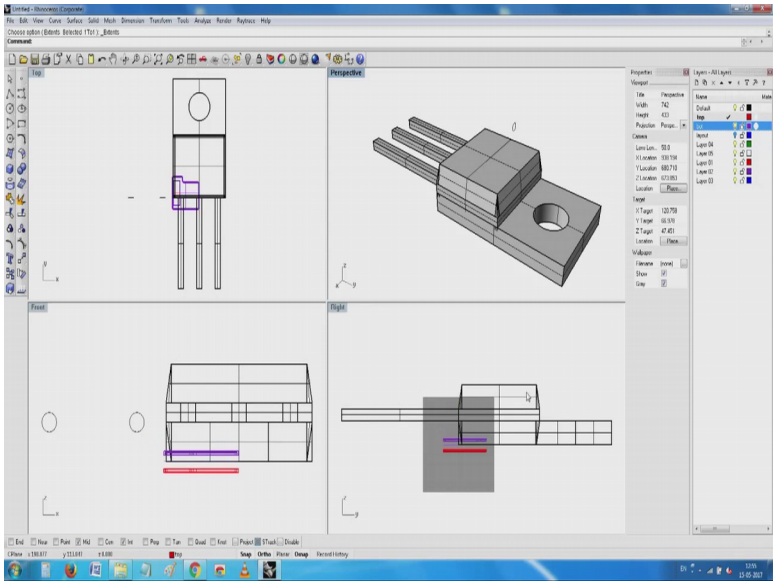

You have seen this my enclosure is lying here and this seems to be scaled up by a 100 times, that apart you notice that over the over the period of your professional what you call this thing, you can create and exchange these objects. If you remember this is the same 3 terminal that I think it is called a t o I am not able to get the name 66 or 67 which is used universally ok.

But nothing is lost because we can always scale these objects, you have seen this; obviously, these objects needs to be scaled. So, I will see what best I can do as part of this transformation, I can make a 3 d scale. Not bad you have seen this this is probably more in control than we what we want. Why I had made this particular object was, that

normally these are the ones that are also required for us to use for things like heat sinks. If you remember one of the boards earlier I have seen he had the same regulator. So, it is now for me to decide on whether I can mount all of these thing on to a plate, and then put an adhesive and attached to one of this covers or mould it along with that covers or put opening surround it. So, that one part of it is the making the enclosure to suit the ergonomics or the use about it another is about now the ceiling part of it.

Now in the corner in the next class I will see whether I can make a small step, just like I have removed the top lot of materials same thing can be done with another material remove a bit of the stuff take it out and then we have the what you call lipping overlap and lipping; it is very easy you can easily build on this the lipping can be made into this corner and then I can also make a gas kit. The moment I have this outline very easy for me to create a gas kit which sits on that.

So, I will stop here because I think continuously it is been more than an hour, but everything is you must write. So, as I said if you have a exercise in mind, collect all the hardware items that you require put them altogether start making layout drawings. Simple 3 view drawing is sufficient for you that is you have a plan view then you have natural features, eventually when you make all the features and make objects like this you will notice very easy for us to construct very complicated what you call products out of it.

Cad has the advantage that once you do it things will be absolutely useful every time and again. So, thank you for being with me and we will meet again bye.