Engineering Drawing and Computer Graphics
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Module – 03
Lecture - 24
Orthographic Projections I (Part - 4)

Hello all, Welcome to our NPTEL Online Certification Courses on Engineering Drawing and Computer Graphics. We are in module number 3, lecture number 24 on Orthographic Projections.

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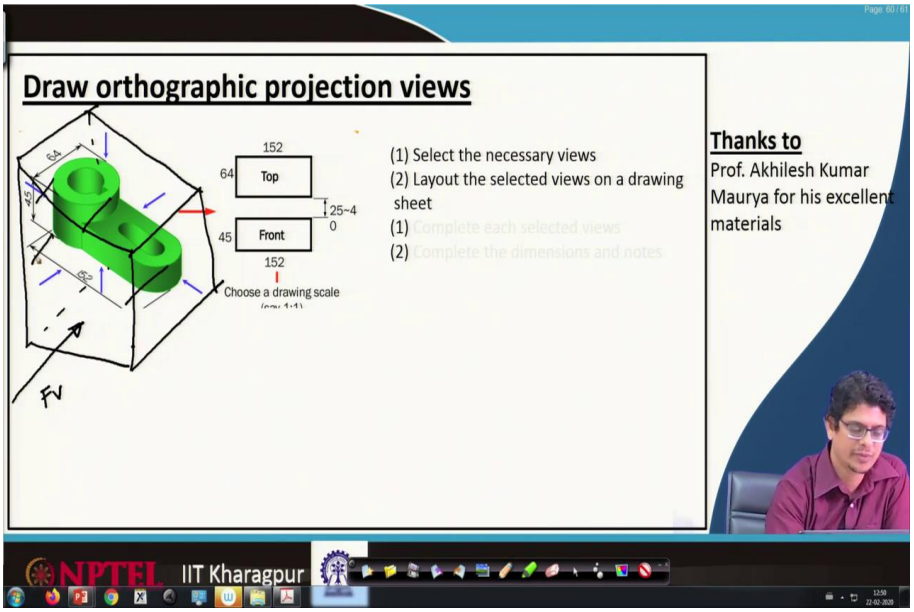

Let us look at orthographic projections of this particular object. So, this object has this cylindrical portion having a deep cut and there is something like a slot. So, that keys can be arranged in that to lock the objects in one-directional thing, we use this kind of objects. And there is one more cut inside of that.

So, it is more like there is a hole passing all the way down, here also there is a hole all the way passing down, here also there is a hole which is passing all the way down. So, the material is present only where these green colour lines are shown, the shadow thing is more like a hollow one. Here also this is hollow portion all the way to the down. And this object is of different dimensions. This length if we are looking from here all the way there this is 152 units.

The height is 45 units and this one width 64 units. This is the object we will like to represent it on the drawing sheet. Now let us use glass box method to construct this views.

For that first of all, we have to decide the necessary views of the object, how many views we might be requiring. Whether just one view is good enough to represent that entire object or all the three views required or perhaps we require top-bottom and also left side right side this kind of views are required. Based on that we are going to show this picture.

Once that is done we have to choose the layout of the selected views on a drawing sheet. For example, we would like to show it using a glass box method the layout. Once it is chosen as glass box method, what we are going to do is; we keep it in the first quadrant this box something like this is the box what we are going to construct imaginary one. This goes all the way down, perhaps look in the direction. So, that front view we are going to get as the projection onto this plane.

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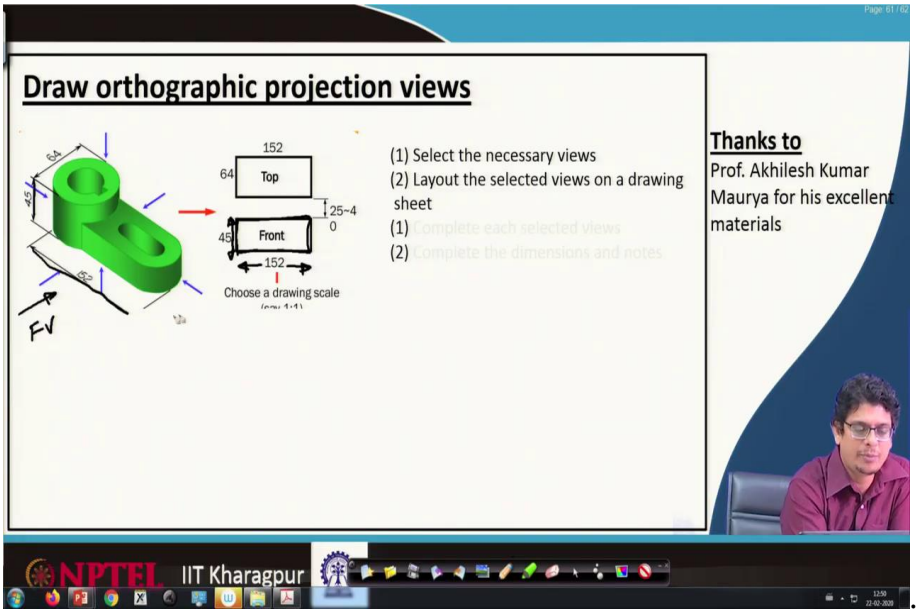

So, that view we will show it here as the front view. So, if we are looking in this direction for the glass box, this dimension 152 will be visible. So, 152 will be visible in that direction. Similarly on the glass box because this is the front view kind of direction. We will be in a position to since 45 ah degree ah 45 lengths also. So, 45 lengths again we will be in a position to see.

So, this entire object will be in between these 152 dimensions and 45 dimensions. Then we go ahead with a top view for the glass box. So, in that we are going to see something like 65 mm, 64 mm and also we will be in a position to see that 152 mm. So, 152 mm again we will see.

So, the front view 152, the top view 152 coincides in that way. However, in the front view, the dimensions what we are going to see is 145; so, this one will be visible. In the case of top view that 45 lines coincide we cannot really sense that depth; however, we can see this width. So, that

64 dimensions we will be in a position to since. And it is recommended that the distance between any front view layout to top view should be a minimum of 25 to 4 mm. At least some gap one has to leave it. One should not construct something like that any view there should be a gap.

And it is always recommended to go with 1 is to 1 scale. Whatever the object size the same dimensions try to use it. If the object is very large and the drawing sheet is small for example, like I would like to represent a big skyscraper on a drawing sheet it is not possible to construct such kind of big drawing sheets.

So, the easiest way is using our Ao sheet A 1 sheet A 3 A 4 this kind of sheets we would like to represent a skyscraper then naturally we have to scale it down. Maybe 1 is to 24 kind of scale, 1 is to 50, 1 is to 100 such kinds of scales we will represent and clearly mention it on the drawing sheet.

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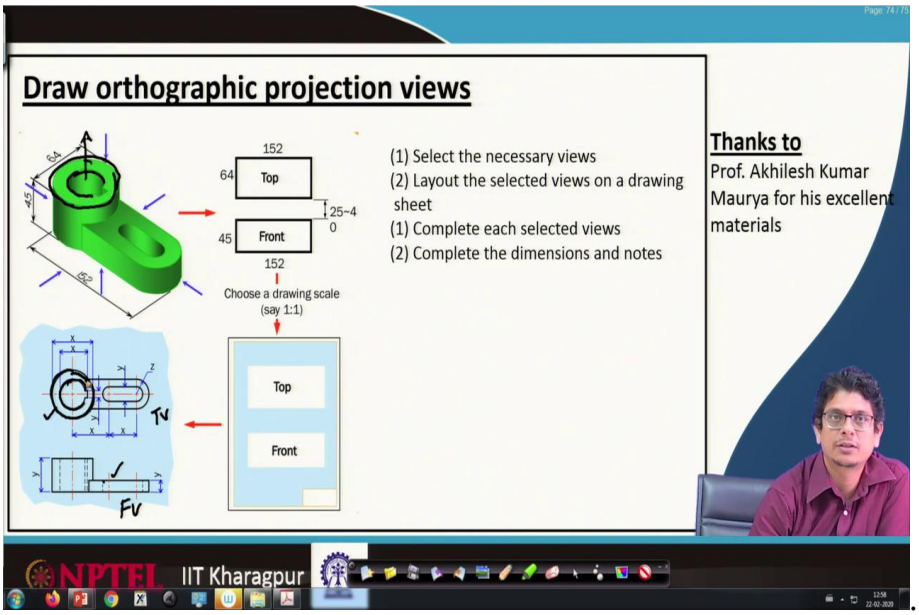

Once this layout is chosen completely is selected view to begin with the front view then construct a top view and complete these views. After that write down the dimensions and whatever the leftover nodes. For example, here let us look at that.

Front view after constructing it on the drawing sheet with minimum gap maintaining, top view one has to construct and after that, we will see the picture the front view picture this one we will see, this entire curve projected like a line then again it goes to that point again we will see a line and this entire curve projected onto one single line. So, that one single line will be there.

And this top one this entire curve projected onto this line on that line. So, this goes to that one. Here if you are noting carefully, this line and this one are different at different layers. So, this one projected to the cylinder there, but this one from the cylinder line what we are going to get.

Let me explain once again; this is more like a welded kind of thing portion what we are trying to see here, but the cylinder line comes there. So, when we are looking from this view this line will be visible and this one there is one more line visible. So, that one the first line is the welded kind of portion is that and from the cylinder, this line comes.

This entire curve will turn turns out to be a straight line on this front view. And this one this portion comes at that level. This entire curve turns out to be a line and here we see something like a line and again this entire line curve turns out to be a straight line on the projection, here we see something like a line that line comes there again from here the top portion comes there. So, this entire portion whatever curve that again comes out to be a straight line there. And these lines will coincide with these lines there is a reason we have it.

Again this entire cylinder curved portion we see it like a straight line on the projection this one turns out to be a line. Now we have something like a hole there. So, here there should be a dashed line. So, a dashed line we have it because it is a cylindrical object there is an axis.

So, there is a dash-dot line goes via that. Here we have a whole representation. So, that is the reason we show it by dashed one and there is a hole there also which goes like a slot cut. So, what we show is; this entire rectangular scooped out region we will show it by two dashed lines.

Similarly, we have this entire slot scooped out the region, there is an arc. So, there must be some centre passing via this. So, we show that as an axis again here there is a curve radius, this one. So, supposed to be centre again we show it by dash-dot line and this slot goes up to that level. So, we show it by dashed one. Wherever the material has removed that portion we show it by dash localized within that object.

Whenever there are centre and a radius scooped out from that direction we show it by an axis which comes out of that object also. More like an extension kind of line we will show this is for the front view. Now project that onto that glass box plane and flip that plane then we will have a top view. Now if you are looking the projection onto the top one unfolding it comes as top view there this entire circle comes out like a circle there. So, the cylinder top portion looks like this one, that one is this.

Inside there is a semi-circle kind of thing. This is the semi-circle what we see and there is a scoop out region. This one is a scooped out region which we will see. Then there is another slot kind of zone on the top view what we are going to observe that one is this. These are two circles having radius may axis is passing in that way, the axis is passing in that way.

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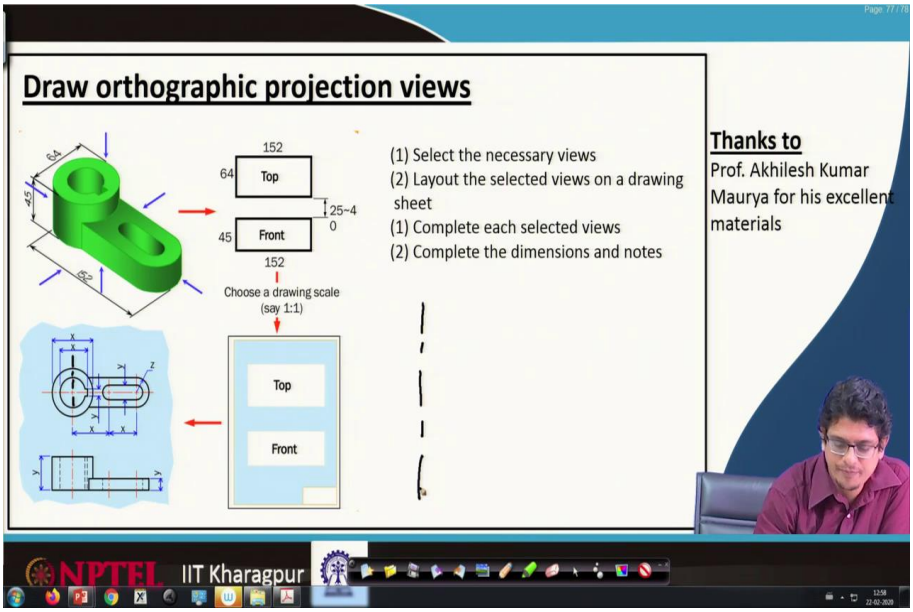

So, we show it by a dash-dot kind of line. A big dash line followed by a small dash again big dash small dash this is the way we represent an axis.

So, here that big dash, small, again big one, small, big one, small and big one. Now it is a more like a cylindrical object having this radius more for elliptical kind of portion again dash followed by dot-dash and so on. Now this entire elliptical kind of slot comes here. So, there is a rectangular portion connected by this semi-circle portion. This is the way we construct the top view using a glass box method.

Once it is done wherever we will feel this maximum dimensions that maximum dimensions we are going to show it on that object. Now it is not necessary that front view always is in this direction.

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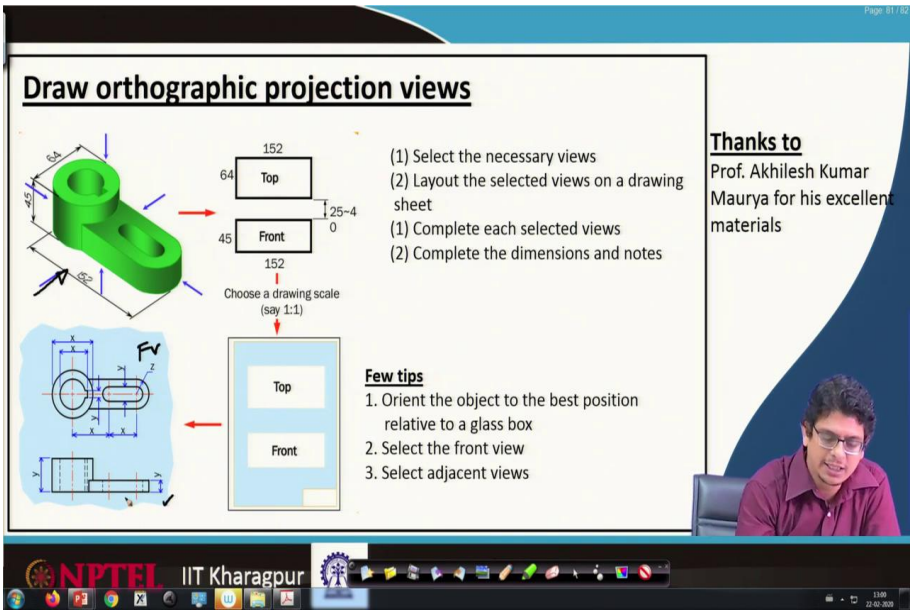

It is not necessary that front view is supposed to be that. We can always pick this one also front view where we are going to pick maximum dimensions that dimensions what we are going to pick as a front view. In this case, if this is the front view the bottom one what we are going to show. So, the bottom one comes at the bottom level.

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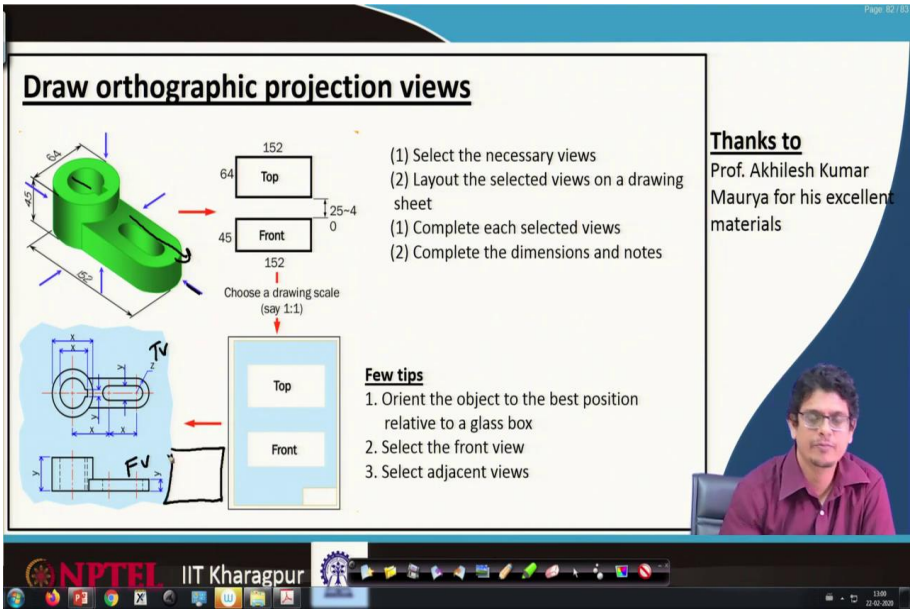

So, that can be bottom view also, but once we fix this one as the front view direction, then this will becomes this is the front view this is the top view for glass box method. Then side view if we are going to look at it the projections onto that plane we have to get for this glass box method then that view comes at this level.

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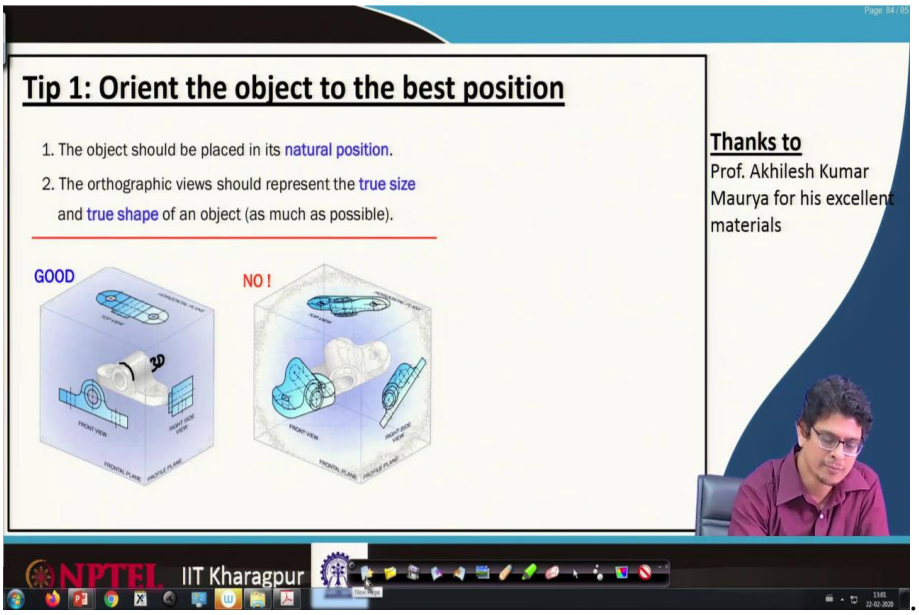

Let us look at a few tips for these projections. First of all orient the object to that best position. Pick the object place it in a natural position. After that orthographic views should represent the true size of that object and also is supposed to show us the true shape of the object and that should be as much as possible.

For example, here two orthographic projections we are showing. One is good, there is nothing wrong; however, what is good what is not that good we have to decide. For example, here there is a bearing like a shape is present the 3D bearing kind of shape is present and we have to decide what are the views. This bearing might be initially turned in that direction.

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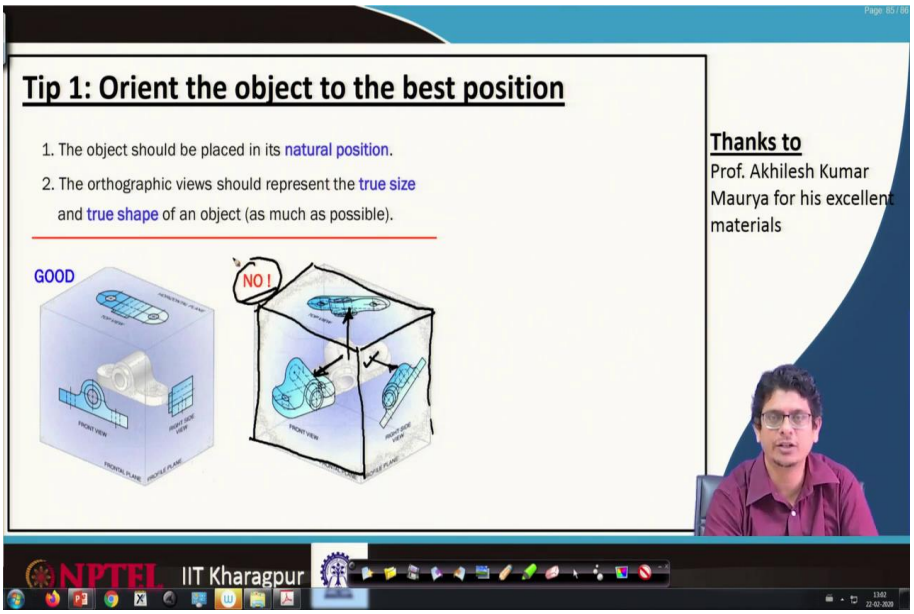

And if we are straight away picking that turn kind of direction to construct a box using glass box method project this box ah project this bearing onto that front view. Similarly, project it on to top view, project it on to the right side, there is nothing wrong; however, constructing those views becomes a bit difficult. So, is not a good idea so, try to avoid such kind of things.

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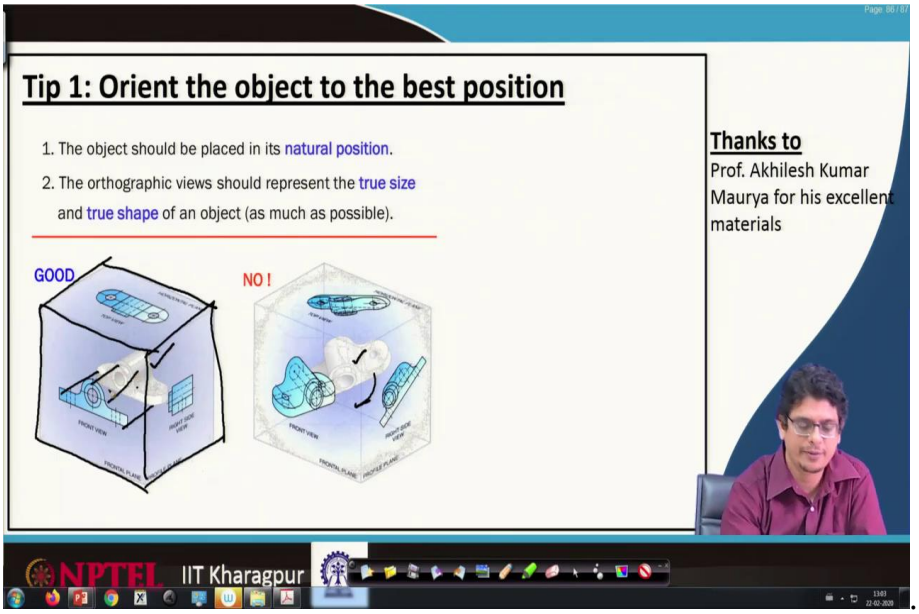

Instead of that, what we could have done? Turn this object into one particular thing. So, pick the natural projection position perhaps slightly turn it in such a way that aligns with the glass box

method. This is the initial configuration rotate it such a way that maximum views we can see and constructing views also becomes easy for us if we can do it in that way. So, this method is good.

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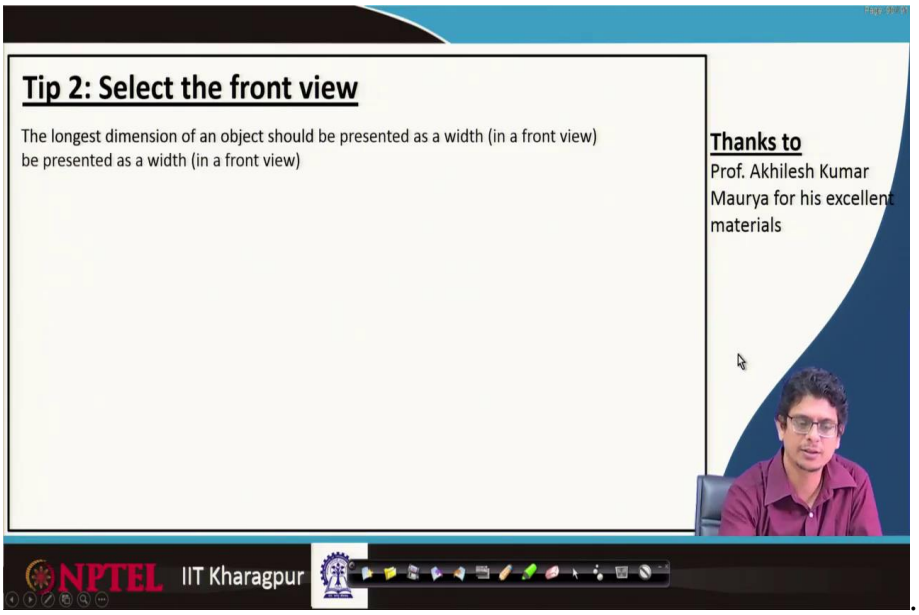

Now, we have to pick the front view to decide that the longest dimension of an object should be represented as width in front view. So, let us look at that these are the few tips to construct any views.

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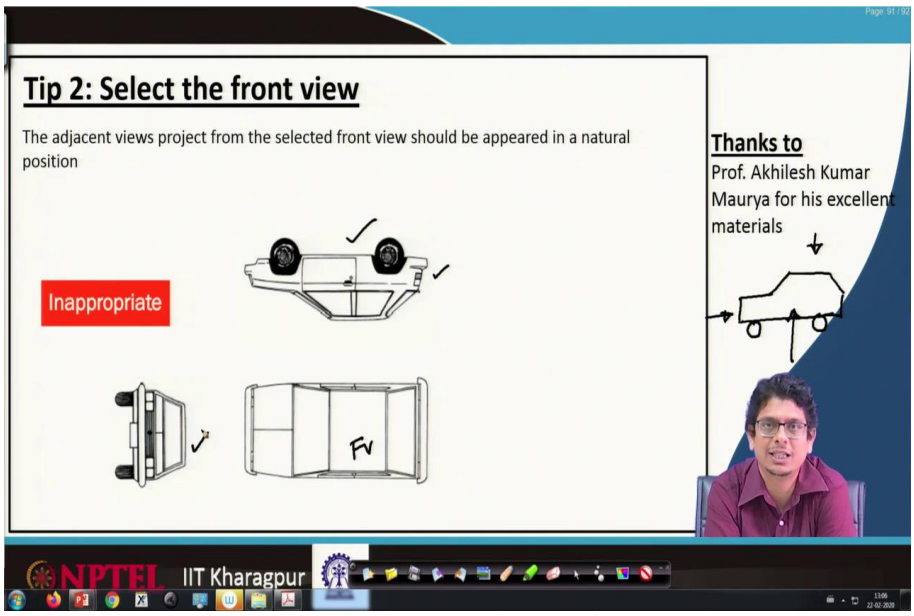

And any adjacent views project from selected front view should be appeared in a natural position these are the two tips what one can follow.

Let us look at these tips, for example, we would like to construct views for a car, automobile car. If we are constructing views by looking from the bottom side perhaps the car might look like this perhaps this bottom left-right depends on how we are going to keep the car. For example, let us consider our car is of this kind of shape.

If I am going to pick this one as the front view, this is the natural way of picking up that view. One can pick this one as also one of the view; however, this is not appropriate for this picture. So, you have to have this kind of intuition what is our natural way of looking at that car and bring that one as the front view. So, if we are picking this one as the front view this is not very natural for this car.

For example, if I am calling this one as a front view and from the bottom of that car if I want to really look at that car turns out to be in that way. So, this is not a good idea. The side views if we are picking it in that way this is not a good idea. Instead of that, what we could have done for the same car

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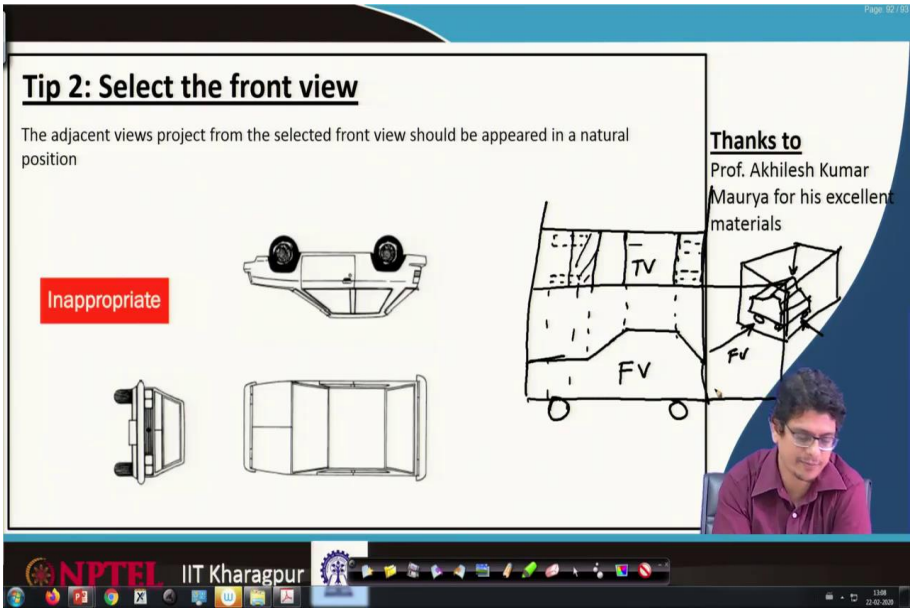

This one we could have done front view of the car which is placed. So, the box in the glass box method car might be in any inclination, but if we are going to decide this one I would like to have a front view I would have placed the car in that direction. So, the car goes in that way.

So, the top view when we are trying to make it goes via this one. So, this is the front view, the top view would have been such kind of thing having this one, wheels are going here, map

matched with these wheels. This is the ah windshield what we are going to have, this entire stuff is windshield the top portion again this one coincides this one.

So, this line of the car coincides with this one. The top portion of the car goes there, it ends there, again this portion matches there an incline and this wheels turns out to be here. So, this is the top view of what one can really draw for a car. Side view we have to look from there project on that and what we are trying to open is this one we would like to open. So, the side view would have come in this direction.

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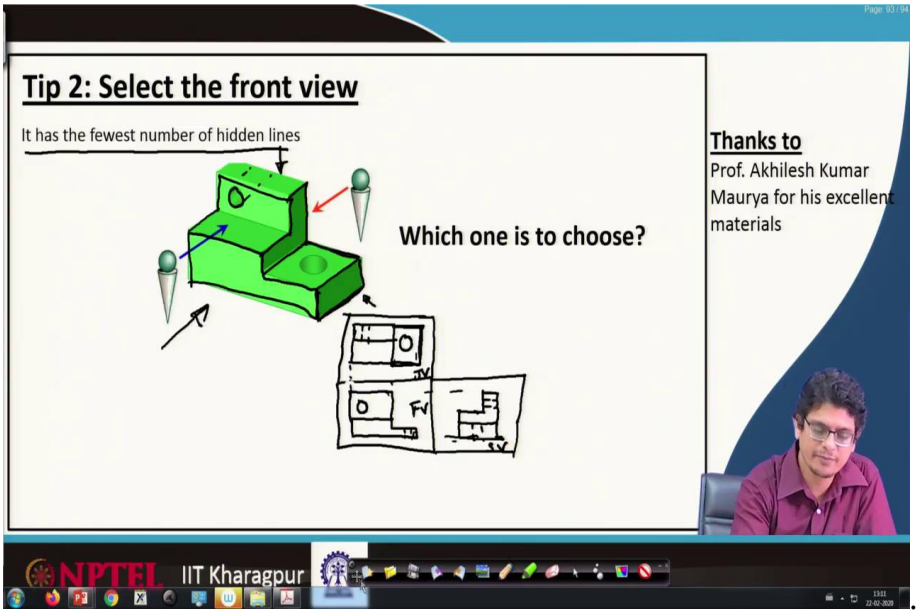

The second tip is; it has the fewest number of hidden lines for the front view. So, as many small hidden lines as possible, we should bring it to that front view. That way also we will be in a position to fully explore that view for the front. Let us look at this simple object. If we are picking this one as the front view; there are no hidden lines we will be in a position to see. For this front view if you are looking at that what we are going to see is; this one as the object as a step and that goes maps via there comes there these lines coincides with that and again these lines will coincide in that way.

So, if we are drawing the front view turns out to be this one comes there. There is an empty portion and this one goes via that portion and top one comes there; there is a hole there, but this hole represented by dashed line there. This is the front view of what we will be going to see. For the top view for the same case if you are going to use glass box method; this line comes there, these lines go via that here there is here again we will see this there is a line, this circle whatever that circle as a hidden line maps there we will see there.

And this leftover portion we will see it in the top view in that way. This entire block for the top view represented for that on this circle we will see that. In that way, we can really construct this top view using a glass box. Side view; if we are going to construct that lets us see this entire object will be bounded by these lines. What we are going to see is; here there is such kind of block that is this, then it goes little bit up comes like L shape and goes via in that way and it comes there. There is a hidden line there and also there is a hidden line. So, this is the side view we represented.

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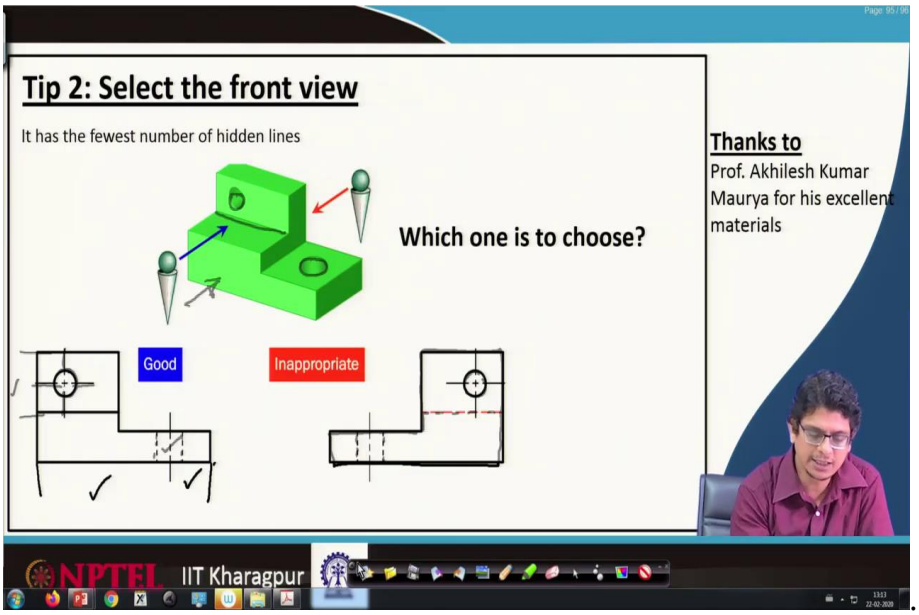

So, if we are looking at that if we pick a front view in this direction; what we see is, this circle will be represented there. So, we can use by dash-dot lines and an only internal hidden portion comes out there. And we have these maximum dimensions represented here and the hidden lines go only at that level. If we are not picking that one as the front view, but if you are picking this backside one as the front view, the way figure will turn out to be in this way.

In that case what we have to do? This circle will be visible; however, this line which is not visible from the backside, we have to show it by hidden line. This circle is also not visible if we are picking this view.

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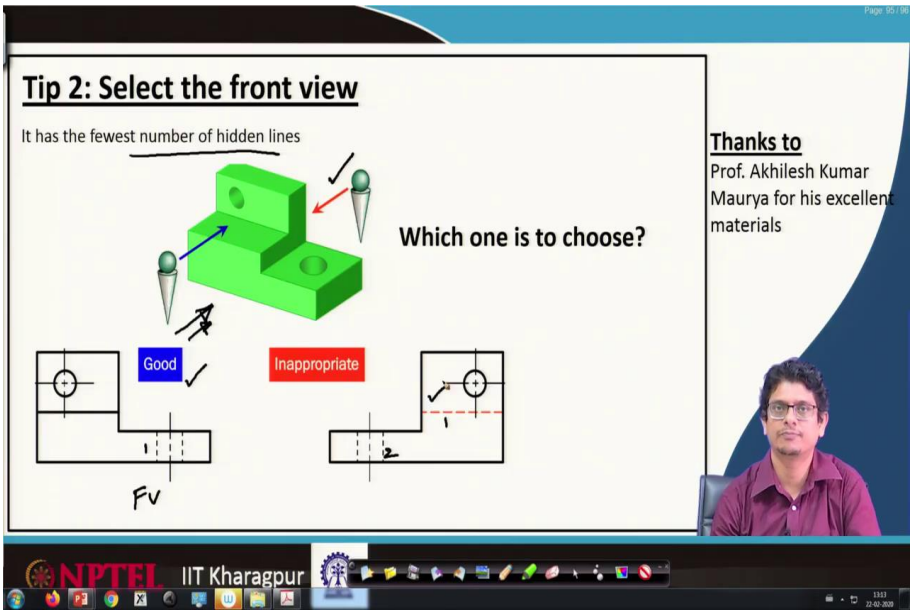

So, again we will have dash lines; that means if we are picking this view one hidden line and second hidden lines we have to represent there. If we are picking this one as the view front view there is only one hidden line we have.

So, by the tip, the fewest number of hidden lines also determines to pick this front view. So, in this direction we have to pick it, this is a good choice for picking front view compared to this one. There is nothing wrong, but the standard procedure to pick something as ah front view as supposed to have this fewest number of hidden lines and is supposed to explore as many details as possible at that front view level.

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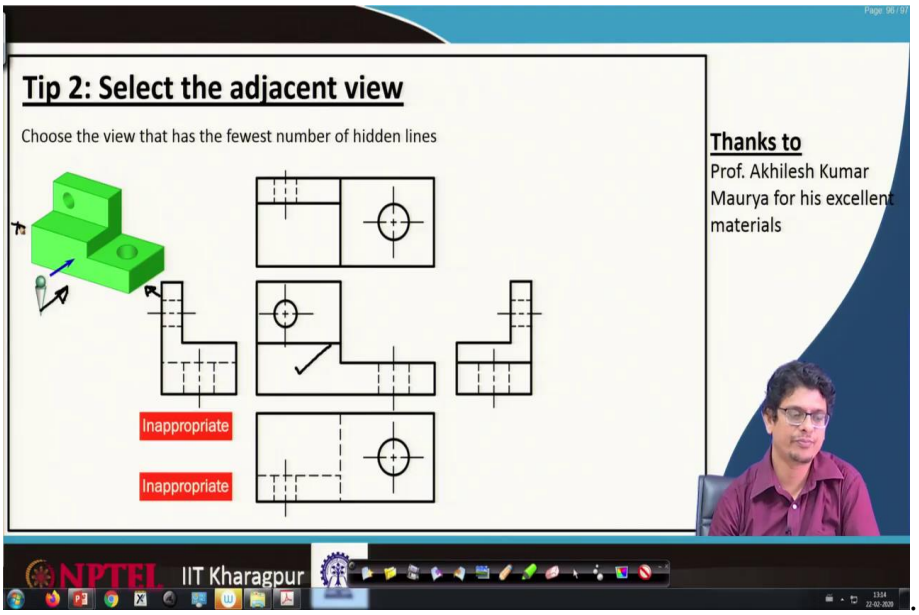

The second tip is to select the adjacent view. Choose the view that has the fewest number of hidden lines. For that, if we are picking this one as the front view, the adjacent view it can be in this direction it can be in that direction also. Again same thing the fewest number of hidden lines we have to pick.

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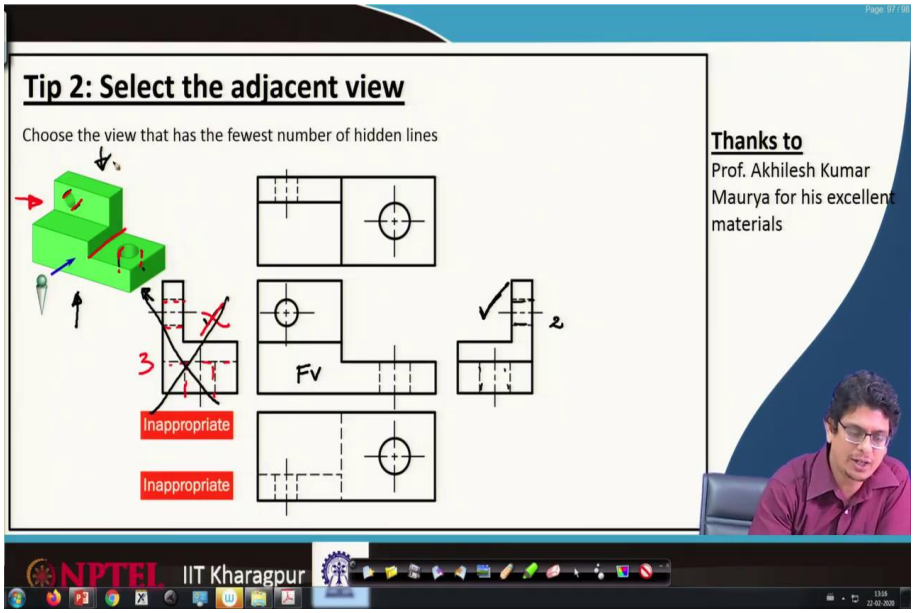

This is the front view we are picking whether this one we would like to use or this one we would like to use, we will see. If we are picking this one the hidden lines come at this level and again hidden lines come at that level. So, two hidden lines for this view.

If we are picking this direction for the view, we have to represent this one also hidden, this one also hidden and also this one also hidden. That means; we have 1, 2 and 3 hidden lines we have it. So, naturally, this is not an appropriate view and what we have to pick is this one as a good view. So, this one should not be used.

Similarly, whether to use bottom view or top view again the fewest number of hidden lines we have to use.

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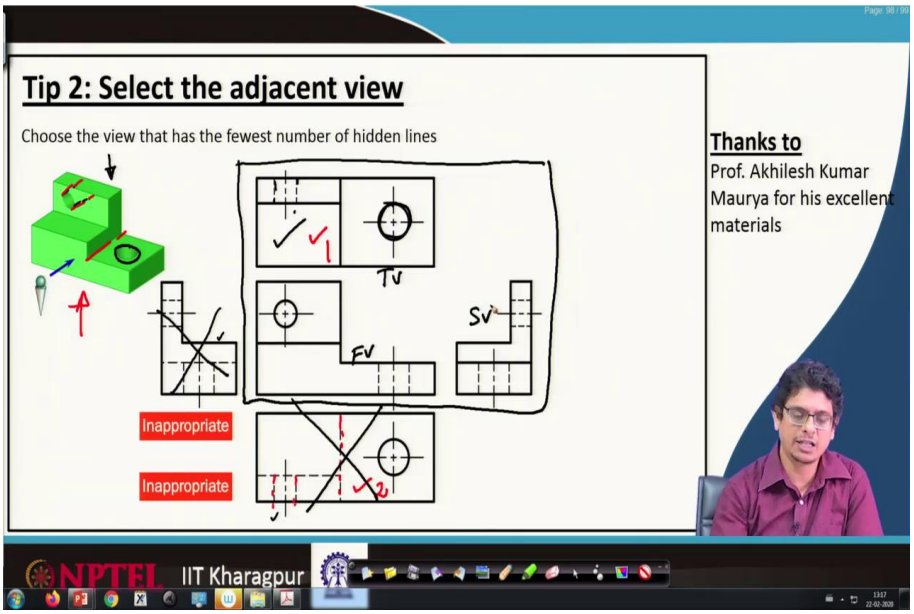

So, if we are picking this one if we are picking this view; the hidden lines comes at that level which is that. This one is a visible one so, we are representing it in that way, but if we are picking bottom view from here, this is hidden. So, what we are going to have is this is hidden this one also hidden. So, this one also is hidden for the bottom one. So, compared to this if we are comparing this one.

Here two hidden lines there, one hidden line. So, we do not pick a view of this, but we pick this view. So, this is inappropriate and also this is inappropriate. So, what we are going to pick is this one for the drawing sheet. We can show these views also, but these are not required when we have this front view, top view and side view. These are good enough to represent this entire 3D object. A minimum number of views is always good.

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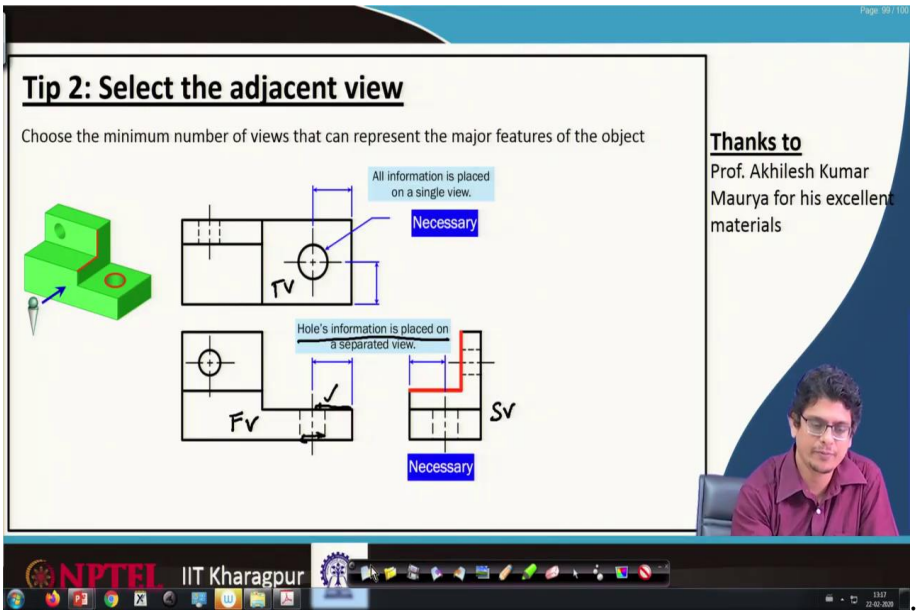

So, if we are constructing naturally the front view, top view and side view becomes in that way. If we are closely looking at that holes information is placed a separate view in terms of what is the diameter from these we will be in a position to know. Similarly, how far that is from one of the edges that also we will have it. And from the top view, we will be in a position to sense clearly whether it is a circular hole or elliptical hole and at what level it is located these dimensions.

So, all the information is provided by our front views and top views. The remaining information we will get it from the side view.

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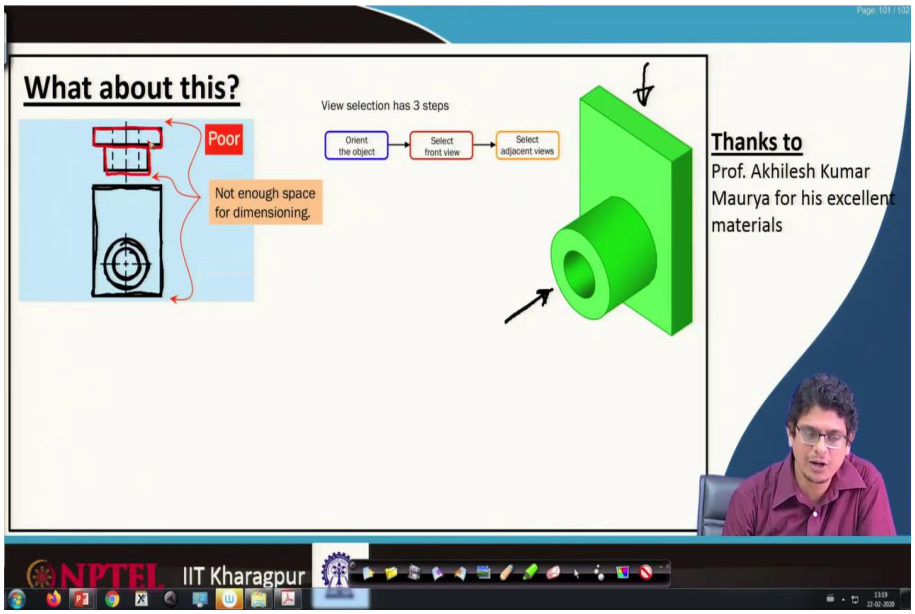

How about this object? Think about it. First of all, we have to orient an object in such a way that it will be appropriate to keep it in the glass box and simplifies our views. Second, we have to pick the views which one is the front view. Once it is done the adjacent views we will construct.

Take some time to construct these views, think about it. For example, if we are going to pick this one as the front view and this one as the top view, some of the dimensions might not be appropriate. So, the object is located in that way if I am going to pick this one as the front view; we will have circle again one more circle and this entire rectangular block turns out to be in that way. For the top view; if we are looking from that direction this entirely looks like that.

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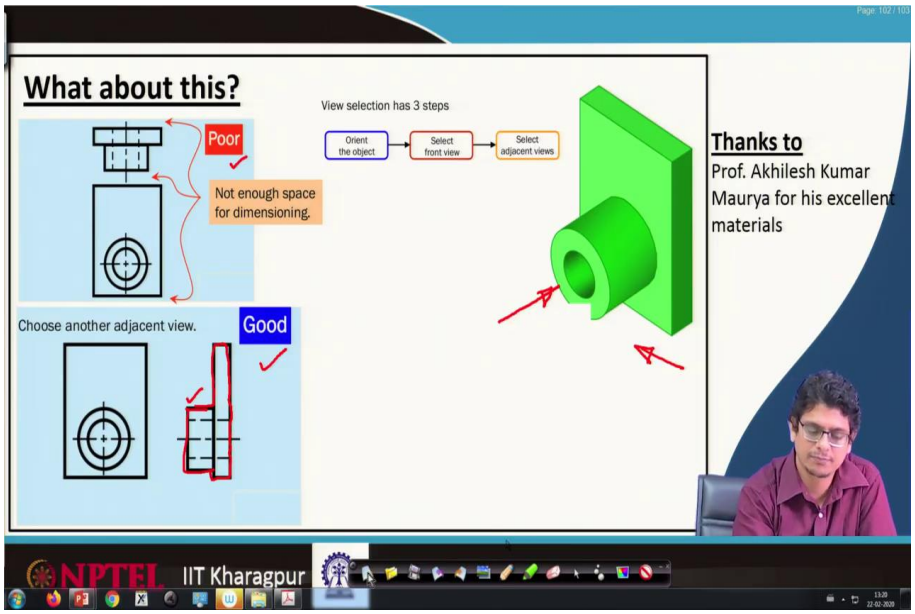

There is not enough space for all the dimensioning we will not be in a position to appropriately show it. Instead of that, what we could have done? Pick the object in such a way that front view will be this one instead of showing top view; we could have shown side view.

So, the side view will be in that way. This gives maximum details about the object. Here it looks like a symmetric kind of object; however, a clearly shows the offset location of that picture and also it shows that we have some kind of protruded kind of portion. So, this is a good way of representation compared to this.

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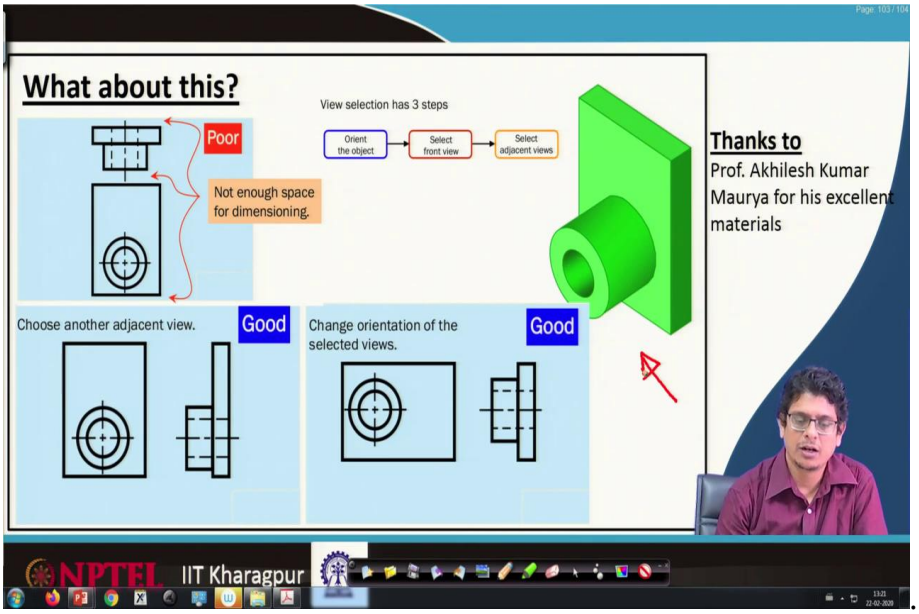

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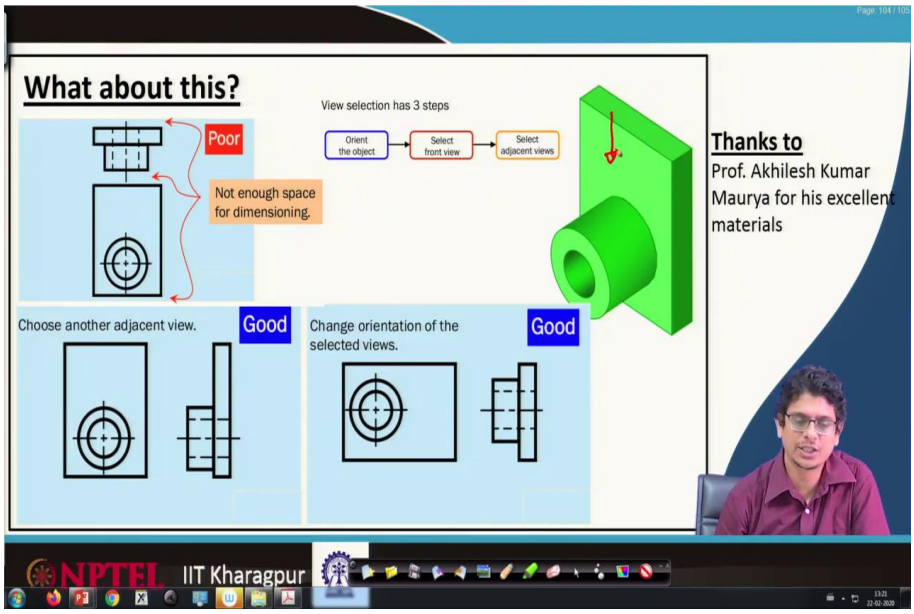

Similarly, we could have used front view in that direction also. The front view we could have used in that direction also. So, whatever good looks and gives you maximum dimensions on the other side views the minimum number of hidden lines that view we could pick it as a front view and adjacent view.

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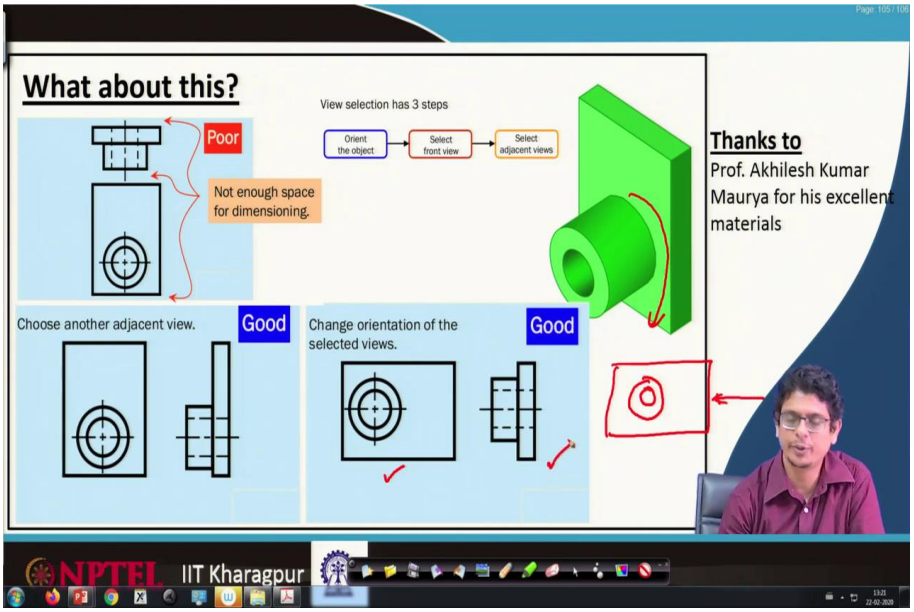

Here if we are looking at this one as the front view. What we can do is; turn this object in that way. So, that it comes out to be in that way. So, completely rotate it by 90 degrees. Whatever the view we will get after rotating that one front view and look from the side view of that object, then it turns out to be this one.

So, end of this class you have to guess these examples based on the object; pick any object perhaps a mouse, maybe your pen, maybe a drawing sheet, scale, this kind of things keep it at a different kind of orientation. Try to visualize what might be the front view, what might be the side view, what might be the top view, bottom view using a glass box method. Many more details about these orthographic projections we will see it in the next class.

Thank you very much.