Engineering Drawing and Computer Graphics
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Module - 04
Lecture - 39
Orthographic Projections II (Part - 9)

Hello all, welcome to our NPTEL online certification courses on Engineering Drawing and Computer Graphics. We are in module number 4, Orthographic Projections II. Especially, we are covering the projection of planes.

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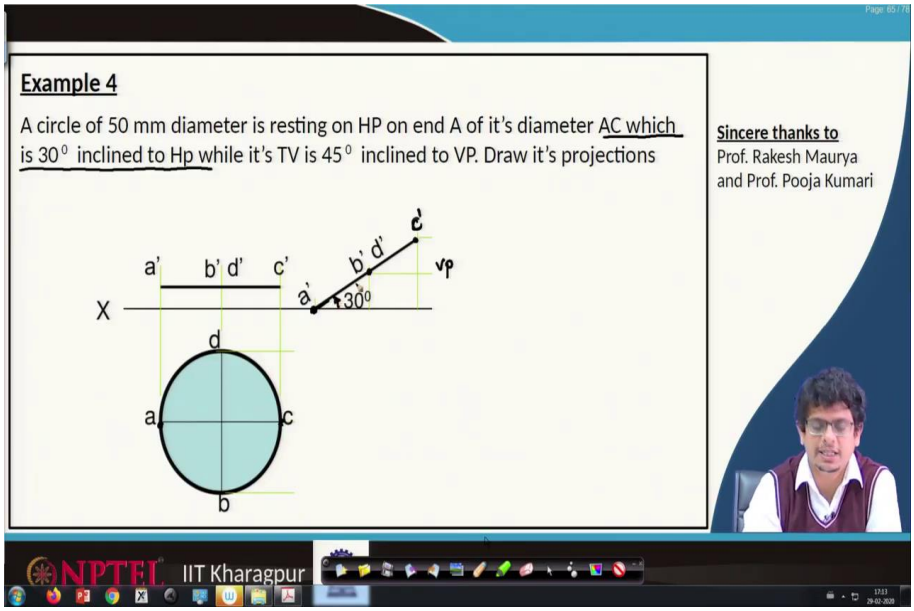

And we are looking at different problems especially, the shapes like triangle, pentagon, circle this kind of things. If they are reoriented with respect to the vertical plane, horizontal plane what kind of projections do they make.

Here, as an example 4, we are looking at a circle. The problem statement goes in this way. A circle of 50 mm diameter, it is resting on the horizontal plane on end A of its diameter AC which is 30 degrees inclined to the horizontal plane.

So, once we have a circle, we can construct different diameters. One of the diameters is this AC, the other diameter we can make it like BD. This AC diameter is making 30 degrees angle with the horizontal plane. So, first of all, we have to make a circle, rest it on the horizontal plane, then one of

the ah diameters it's making 30 degrees so, that we will be in a position to visualize that in the vertical plane.

Once it is done, the top view means after that 45 degrees whatever we are trying to locate that is going to make 45 degrees inclined to the vertical plane so; that means, again we will rotate that plane into making 45 angles with the vertical plane. So, first, do it in a reverse way from the beginning with 45 degrees, go for rotation of 30 degrees and finally, obtain this original figure.

So, let us begin constructing a circle. So, here a circle where ac is one of the diameters and bd is the other diameter. We want to keep this ac resting on this horizontal plane that is a reason we made this ac in this way. This is the top view, complete circle visible. Now, in the front view if you are looking from this side, only this ac portion we will be in a position to see where bd are mapped. So, those points are a', c' and the rest of the b' and d'.

Now, we will like to have this ac making a particular angle like 30 degrees with the horizontal plane AC point 30 degrees inclined to horizontal plane how we will see. This a and c unless we lift this keeping that a point on the ground, still it is on the horizontal plane, lifting up this c point in the vertical direction which we will visualize it in the vertical plane so, this is the vertical plane here, a point remains same at the ground level, c point goes to c'. Now, join that diameter, the complete diameter we will see. So, that a' to c' we will rescale it. The BD points are at midpoints and these midpoints we will locate it and this ac' makes 30 degrees.

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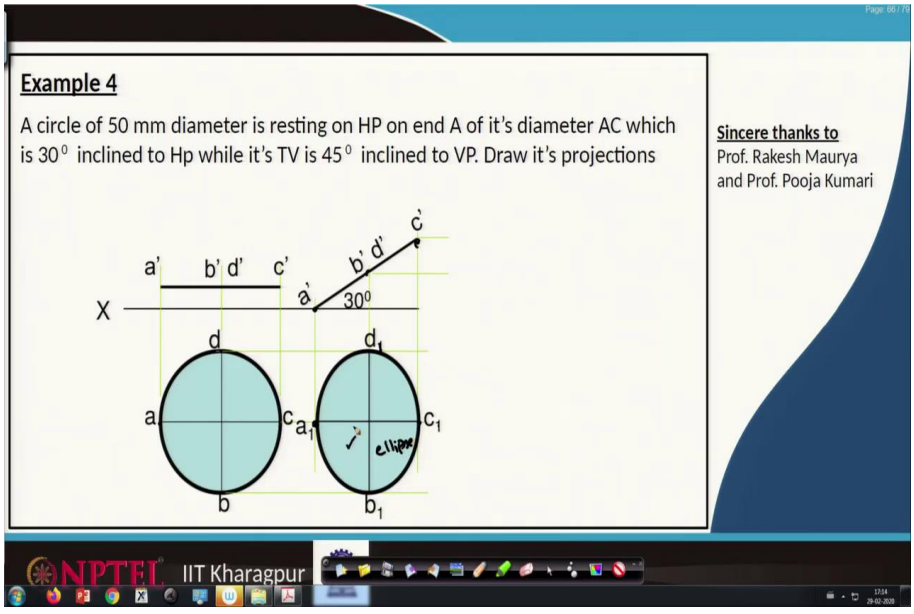

Once that is known, now we have to make 45 degrees angle that how we are going to make it is projected these lines, first of all, a all the way to a down, c all the way to c, b and d. Now, a if it is mapped to a 1, d mapped to d 1, c to c 1, b to b 1. So, when we ah lift this by 30 degrees, the complete circle looks like an ellipse, it looks like an ellipse here.

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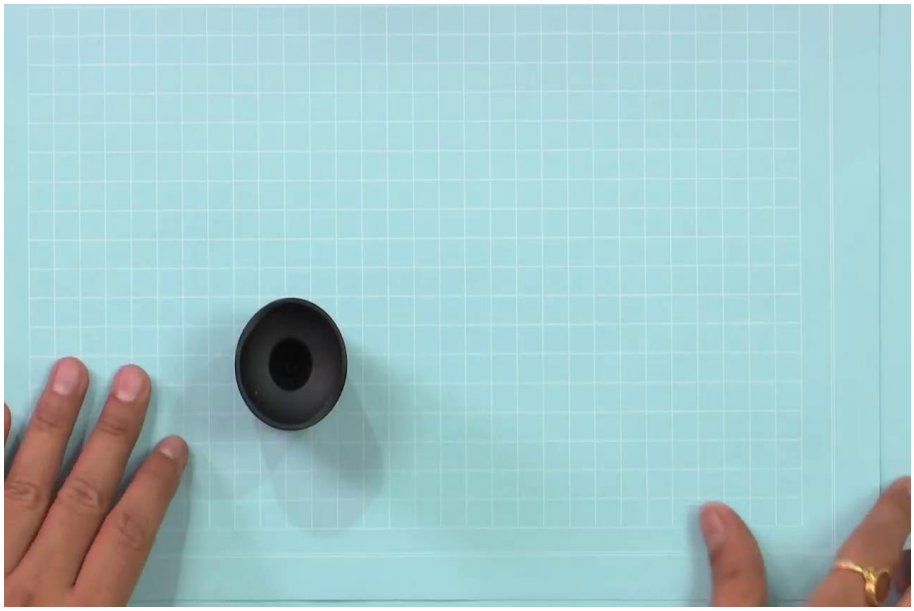

Let us take one example though it is not circle cylinder on the sheet. This circle, if I am rotating it lifting it by 30 degrees, this frontal portion circle turns out to be something like elliptical kind of shape. So, this is the ellipse what we are trying to locate that ellipse is this on the sheet so, here.

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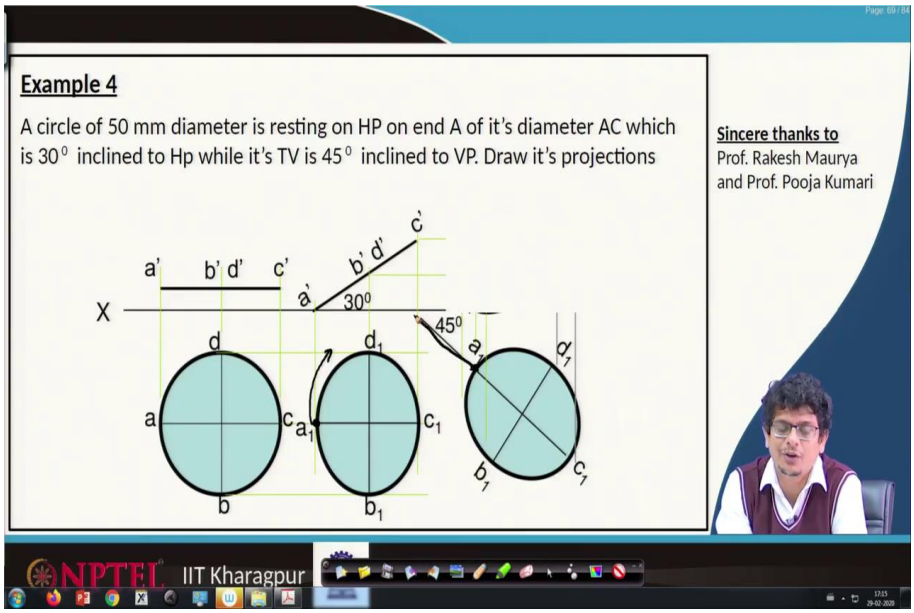

Once that is done, this plane has to be rotated by 45 degrees and thus, inclined to the VP. So, once we have this kind of ellipse, what we are going to do? That ellipse entirely we are going to rotate it in that direction. So, that in the vertical plane, ah top view we can see that rotation.

For example, this a point rotated by 45 degrees. So, this one goes via 45 degrees through that plane. Which plane we are trying to talk about? Because we are viewing it from the top view. In the top view, if we are observing some angle; that means, this diameter must be making a 45 degrees angle with the vertical plane.

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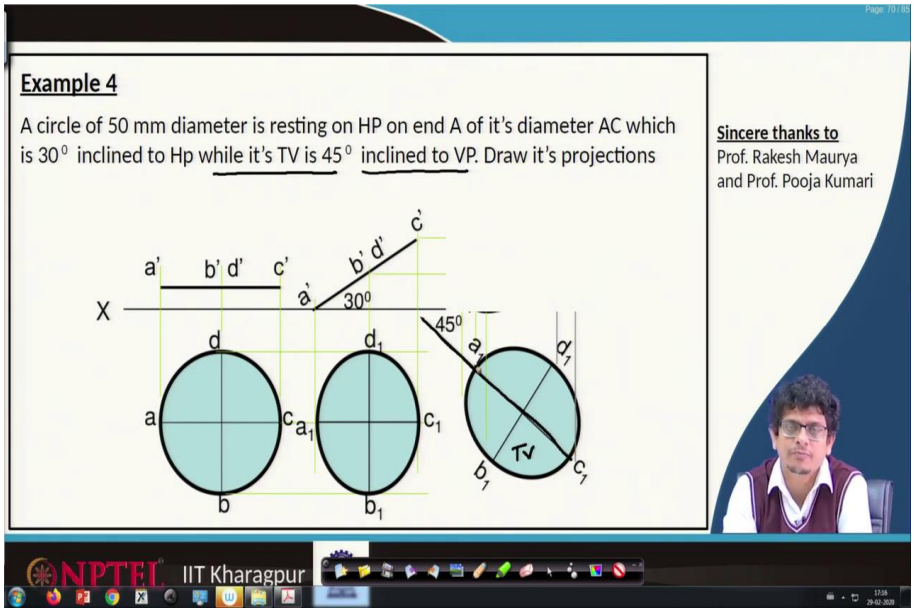

While its top view. So, this is the top view that has to make 45 degrees inclined to the vertical plane. So, this entire ac line supposed to make 45 degrees. So, we rotate it in such a way that we will get this 45 degrees line.

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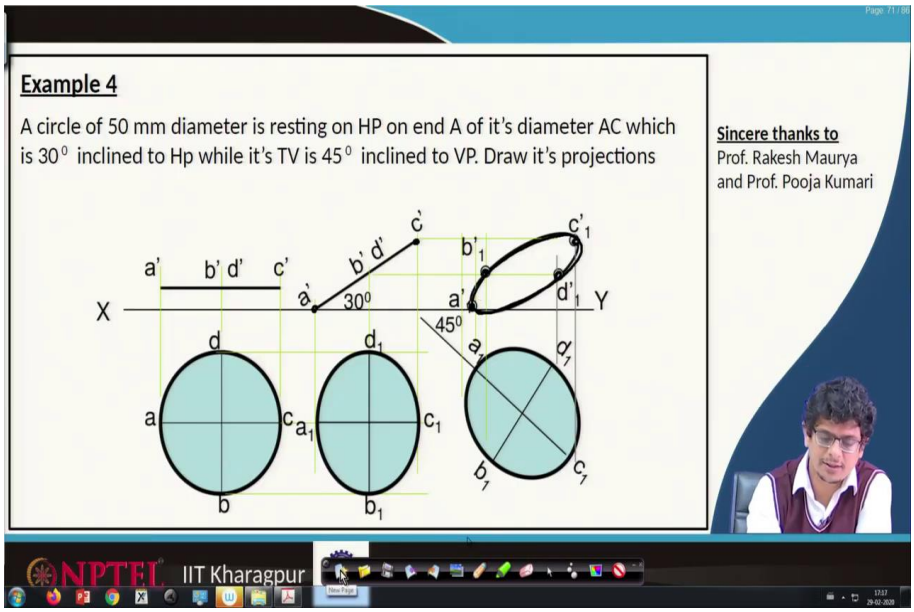

Correspondingly, the b 1 points, d 1 points are also mapped. Then, we will we can have these projections. Once we have this a 1, b 1, c 1, d 1 the way how we rotate is this ac line from here through that we are going to make it 45 degrees so, the projections always give us this a', b 1', c' and d' through that we have to draw a freehand sketch which makes an ellipse.

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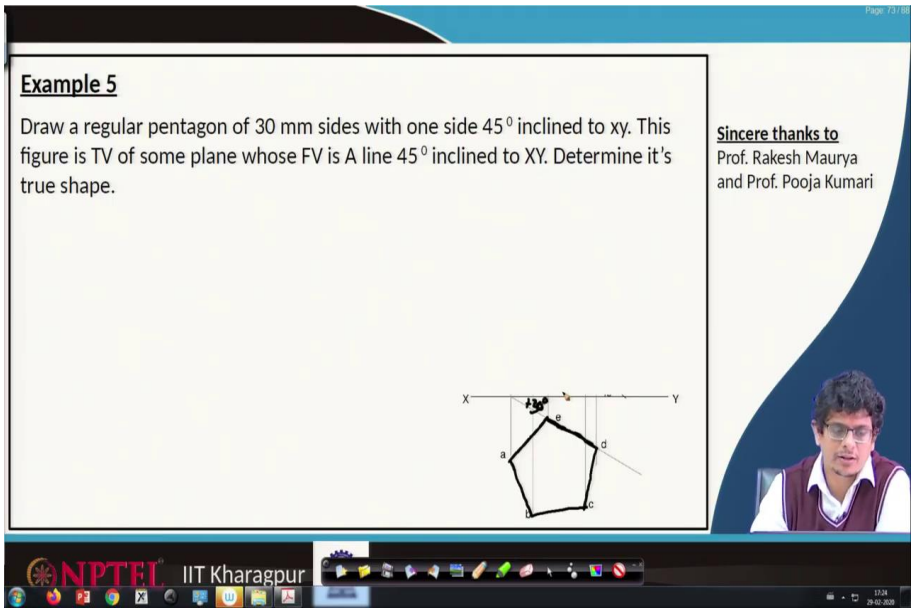

Now, let us look at a new example. Here, there is a regular pentagon of 30 mm sides with one side is 45 degrees inclined to XY axis. This figure is a top view of some plane whose front view is a line 45 degrees inclined to XY. If that is the case, determine its true shape.

So, we do not know anything about true shape here, but just we know front view and top view of some object. If we know that top view front view and top view, is there a way we can determine what it might be in true shape? So, to do such kind of problems, we have to learn about something named auxiliary plane methods that simplifies most of these issues.

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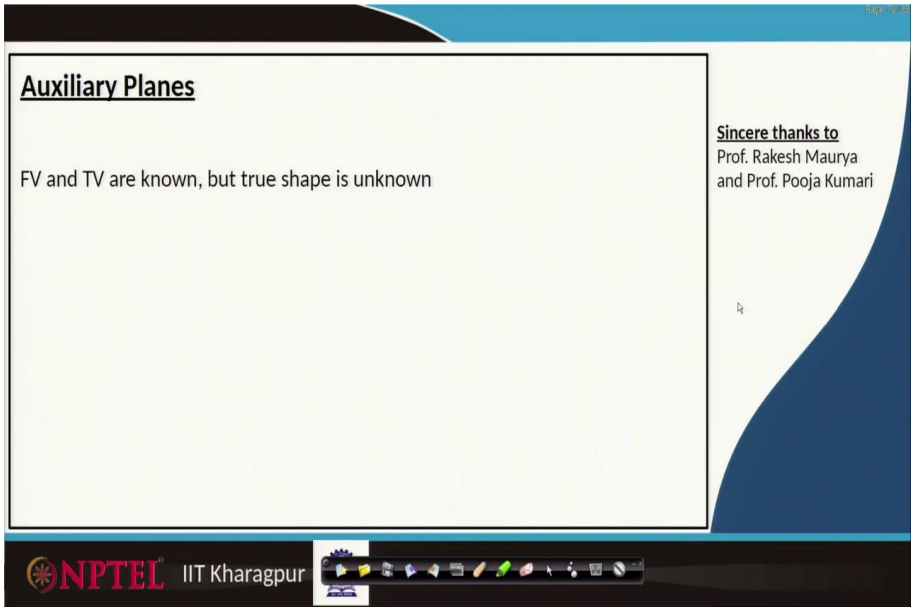

So, in this auxiliary planes' thing, what we always know is the front view and top view. What we do not know is the true shape. In the front view, it might look like a regular pentagon, but true shape might be a different thing. We do not know whether it is a true pentagon or not. If that is the case, let us first learn about a new concept name auxiliary plane.

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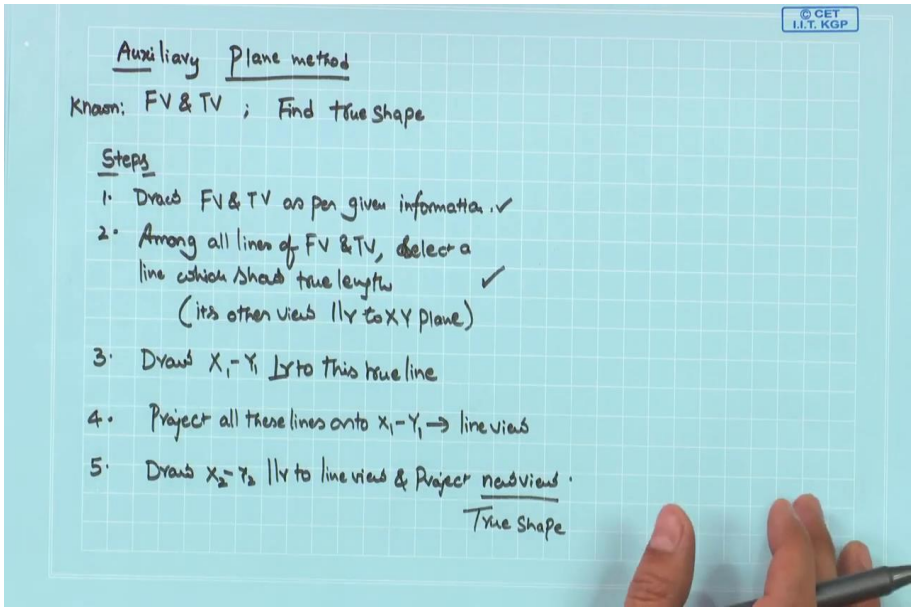

So, the auxiliary plane method. It is a very powerful method for which we know the front view and top view, these are known. What is to be found? True shape.

So, if we are following a few steps as a recommendation, then we will get this true shape. First of all, whatever the front view and top view is given draw them, draw front view and top view as per the given information.

Then, among all lines what we can see a different view and the top view. We have to select a; select a line which shows true length, for example, 30 mm side supposed to be the true length if that is the thing, then we have to pick such kind of line.

When we are doing that? Because it is a true shape is another view must be parallel to the XY axis. Whenever we have this true shape, true lengths other views always be parallel to XY plane. Then, we will construct a new axis a new X 1, Y 1 axis or plane perpendicular to this true line, true length.

So, first of all, one has to draw this front view, top view. Then, among all those lines, pick a line which is showing true length; that means, the other view supposed to be parallel to the XY plane. Once it is done, perpendicular to the true line or true length, draw one more X 1, I 1 line or plane.

Now, project all these lines on to this new plane which we call auxiliary plane X 1, Y 1 plane. Now, draw X 2, Y 2 again parallel to this project all this line to X 1, Y 1 which we will get a line view and now, draw another XY X 2, Y 2 plane parallel to this line view and project whatever the new view we got it. Now, this new view whatever we got that becomes the true shape.

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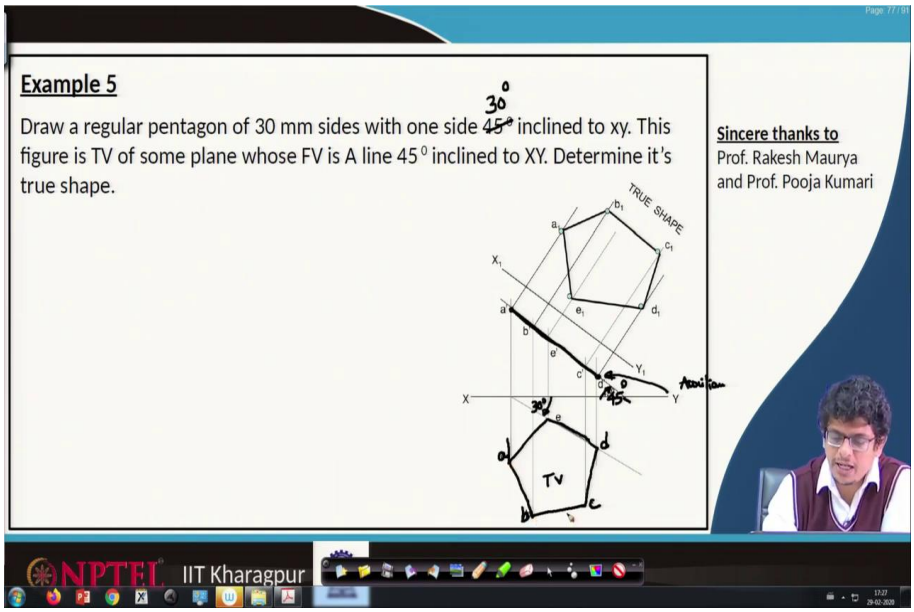

Let us take an example, look at these steps. For example, on this slide, draw a regular pentagon of 30 mm sides with one side is 45 degrees inclined to XY axis. If that is the case, first of all, we draw a pentagon is regular pentagon 30 mm side. So, this is one of the views given with 30 mm side, we draw a pentagon. We draw it in such a way that one of the sides makes 30 degrees angle.

This 30-degree angle ah there is a small mistake here, it is supposed to be 30 degrees well. So, there is a regular pentagon of 30 mm sides with one side is 30 degrees inclined to the X-axis, XY axis. So, 30 degrees inclined to XY axis we have.

So, first of all, we make a regular pentagon having a, b, c and d points. This is the top view for some shape. What is the true shape we do not know, but when we are looking at the top view level, it is giving us a regular pentagon of 30 mm side and one of the sides is making 30 degrees angle to XY?

Now, if we are looking for this figure that front view might be given a line. So, this is the line so, the way we do is projections if we are making it, it made a line and that is making 45 degrees angle with XY. So, based on our steps, we can sense that this line we have to pick for constructing any auxiliary planes and views because that is the true line what we can get.

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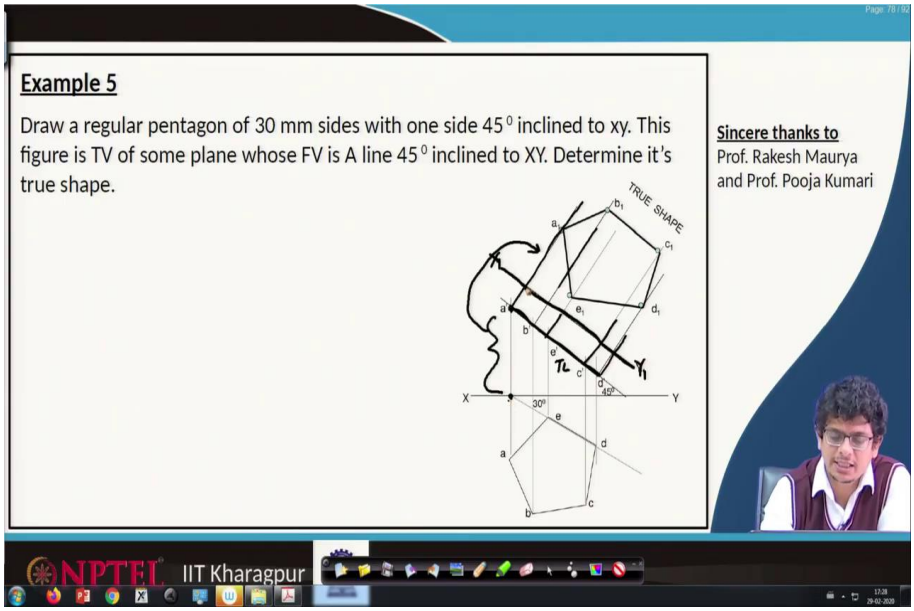

Mark this points a, b, e, c and d on this line. So, those are the thing. Now, we have to draw X 1, Y 1 parallel to this true line. So, parallel to the true line, we are drawing this X 1, Y 1 axis.

Because we know this true line now, project all these lines up in that way we project these lines. Because it is a true line, the point a with respect to X-axis XY axis whatever that length we have that length we will transfer it to this auxiliary plane view.

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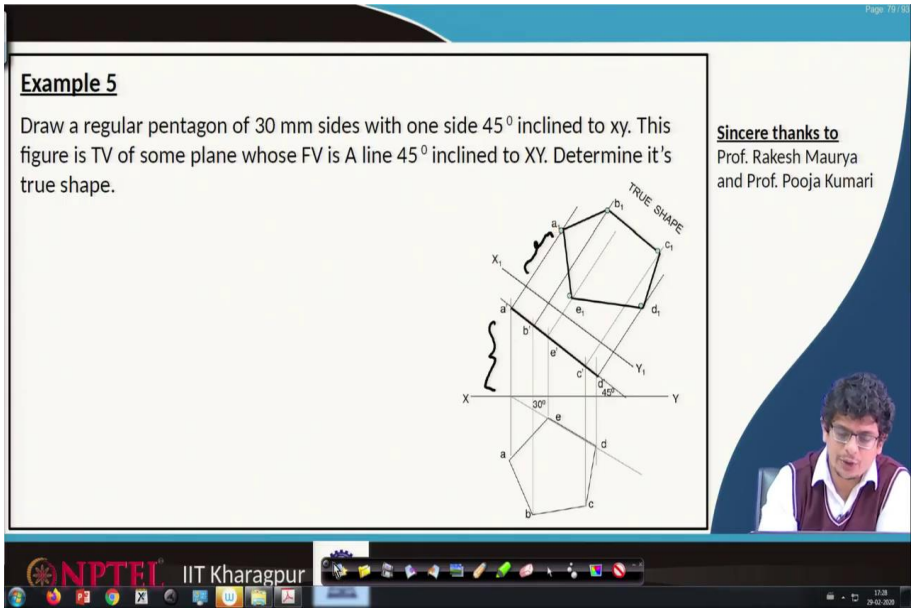

So, a' to X-axis whatever the distance, the same distance from X 1 axis so, this distance and this distance are the same. That is the way we transfer these lengths.

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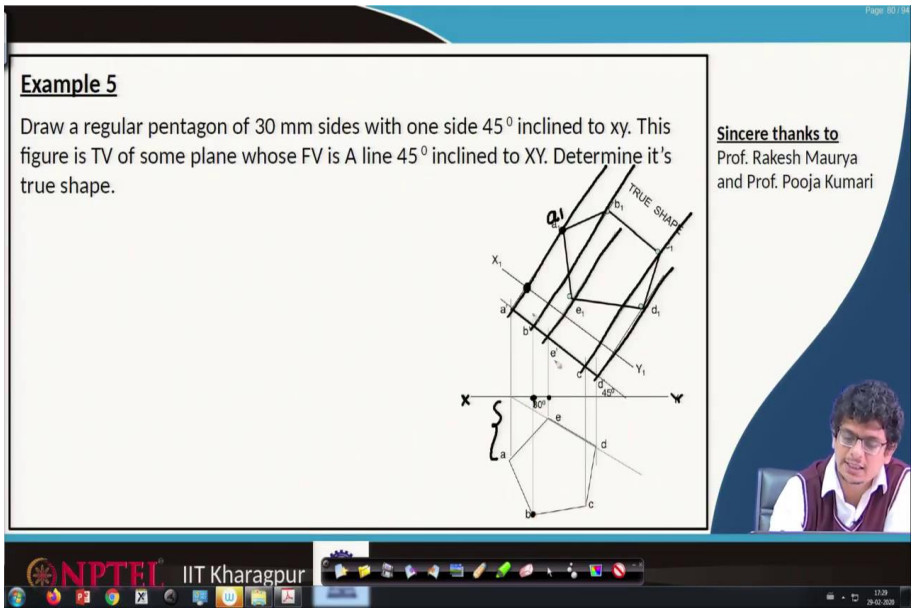

When we are doing that, we get these lines. Now, with respect to XY axis oa point from X 1 point, all the way to a 1 point becomes one and the same.

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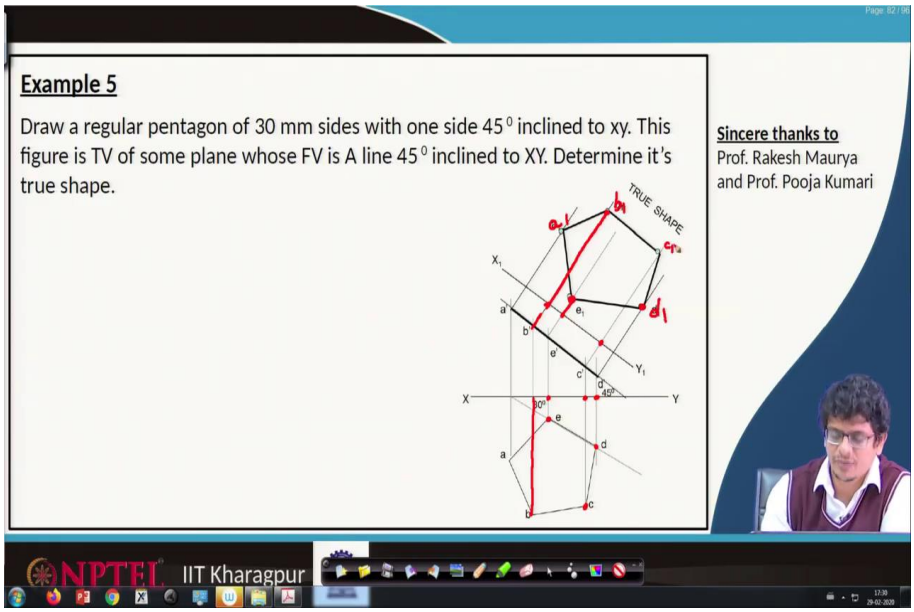

From the XY axis, this is the one from all the way to b this distance we will transfer it from this point to that point let us use some other colour, the red one. So, this length from XY axis to be that line we will project it from X 1 axis here to b 1. So, already we have projected from b 1, on that we use that length to identify b 1 similarly a 1.

The length from X-axis to e point same length we will transfer it to locate it to e. Similarly, from there to d, we will locate d 1. Similarly, point c from the plane XY, we will transfer it from that auxiliary plane all the way to up.

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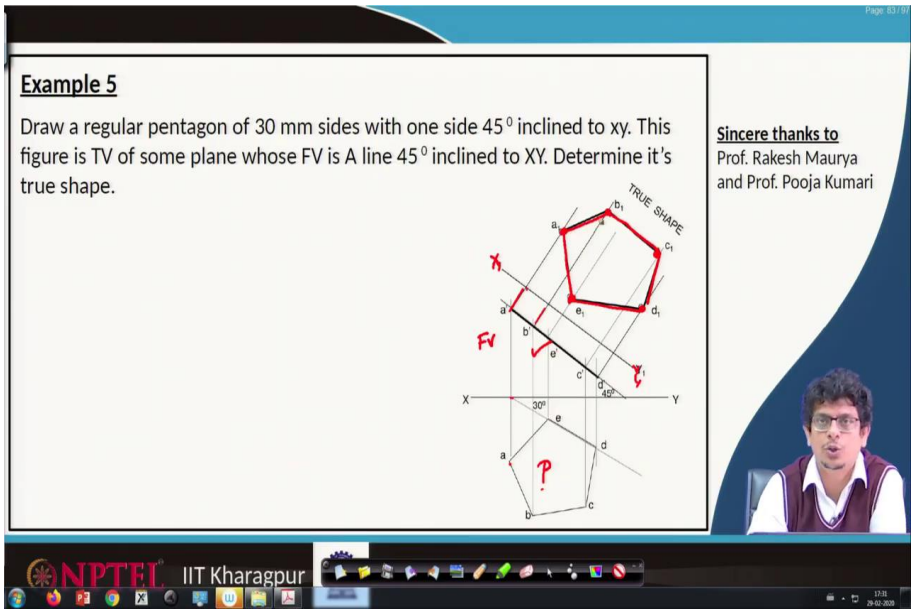

Once we have these points a, b 1, c 1, d 1 and e 1, we connect it to get the true shape or original shape of that object. So, our auxiliary plane method, when we know the front views and the top views in this case, ah front view is giving us a line with true line and the top view is after ah having this view, we are getting a pentagon of regular shape.

Once these things are known, parallel to the true line we will draw an auxiliary plane X 1, Y 1, project all these a, b', e' whatever this front view information we have it, we project it. From X original axis, XY axis whatever the distances we are seeing in the top view those distances we remark it from the auxiliary plane to construct the true shape. This is the way we construct these true shapes for the by using the auxiliary plane method.

So, in the next class, we will learn more about these true shapes and auxiliary planes and then, begin with the projection of solids.

Thank you very much.