Engineering Graphics and Design
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Lecture 5
Projection of simple objects

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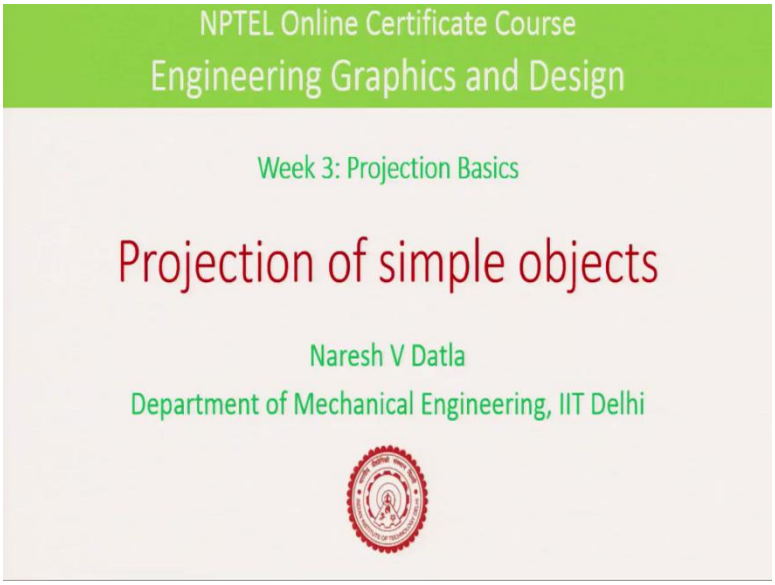

Welcome back to this Engineering Graphics and Design course. We are on week 3. Last lecture we looked at projection of simple things like a point, line, plane and a cube. In this lecture what we will see is projection of simple objects which has several features in it. There are several decisions one needs to make.

First, because it has several features on the object one is to make a decision like which of the views you want to consider it as a front view and second, is to see how to, how many views you need to completely define this object. So, is two view sufficient or more than two views are required? So, that is what we look with the help of a simple example.

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So, to start with let us say if I have an object like this, I am asked to make the engineering drawings of this object. So, I need to decide which view I will consider it as a front view. So, what is the guiding principle? We said that the front view is a primary view that captures the most features.

So, looking at it I see having this triangle at the top is one feature, one slot here is another feature and a slot here is another feature. Let us say maybe in this view, I can capture two of those. So, one this triangular slit sitting on top of this inclined surface as well as this slot. Now, if I say that this is the front view, the second question to answer is how many views do I need to capture this object? So, let us say we capture the front view and the top view. Will that be sufficient or not?

Sometimes what happens is depending on the number of features. you may want to go for a side view as well and maybe even one side view is not sufficient you may want a different side view and sometimes even none of these basic views like the front, rear, top, bottom and the left hand side views might be sufficient.

Sometimes, you may have to section this object or maybe you may have to look it in a different angle. But, in this lecture we will be only focusing on basic views but we will be looking at three different views such that should be enough for most of the objects engineering objects at least we use in practice.

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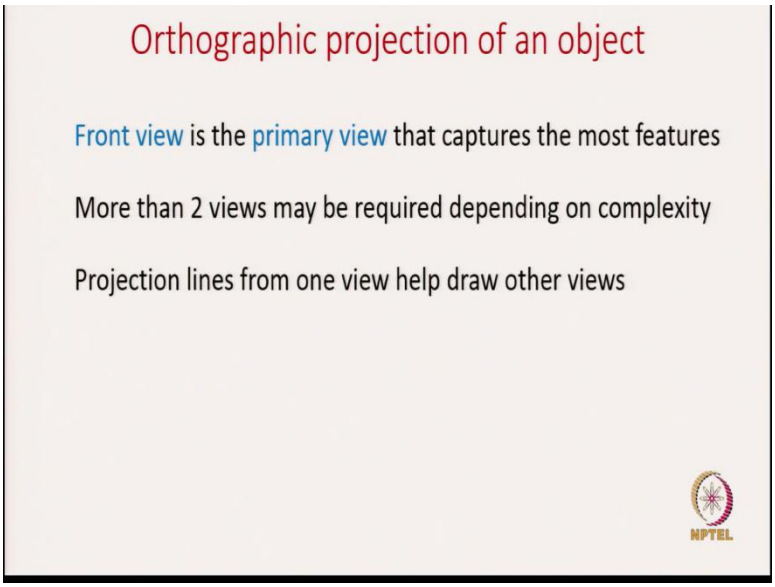

So, as I already mentioned, we may need more than two views depending on the complexity and lastly the projection lines from one view will help us draw the other views. So, that is the beauty of placing these views. So, there is a sound reason why we place the top view either above or below the front view depending on the angle of projection.

The reason is because both the top view and the front view what do they share in common, they share the width. So, in the front view you see the width and the same thing you capture it in the top view. In the front view you get to see the height of the object. Similarly, in the side view you get to see the height of the object.

So, which means once you draw the front view which captures the width and the height, this height information you can use it while drawing the side view and the width information you can use when you are drawing the top view. We will start with again projection of a point. The reason I am repeating this is previous lecture we only looked at two views of a point and in this lecture, we will be looking at three views quickly.

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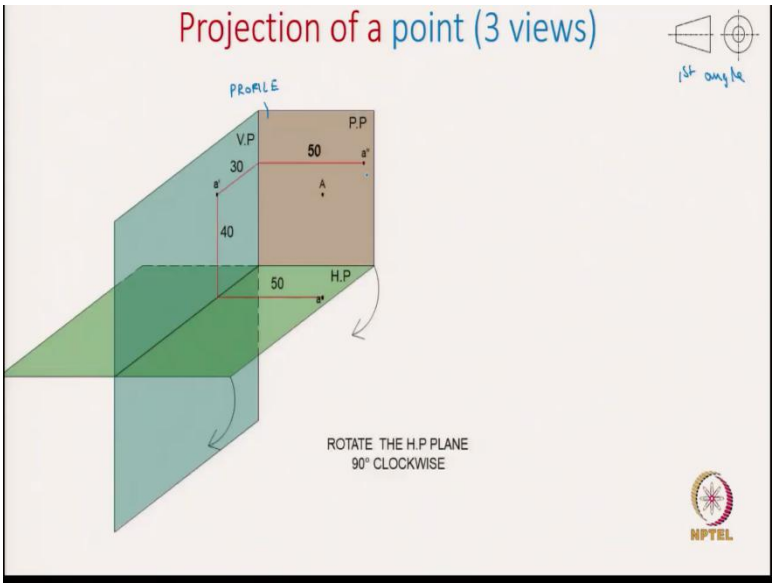

So, this symbol mentions it is a first angle projection. So, which means the point we consider will be in the first quadrant. So, here is the point A, where we already show the front view with a prime and the top view with A. Now, let us say we want to capture the left side view of this point. For this, we need a projection plane.

Where do we place the projection plane for the first angle projection? We place it behind the object. So, in this case it is behind point A. So, this profile plane, this we call it as the profile plane because sometimes the side views are also called as profiles which means that is why we call it as a profile plane. So, now once we capture the side view of point A on the profile plane, how do we represent the point on a profile plane with double prime. So, we name it as a double prime.

So, now we have captured the front view, top view and the side view. So, all of the, these three are lying on three different planes which are perpendicular to each other. So, for us to draw it on a drawing sheet we need to open these three planes such that they all fall on a single piece of paper. So, for that we said the front view is never altered, so we keep the front view as it is and then open up the top view and the side views.

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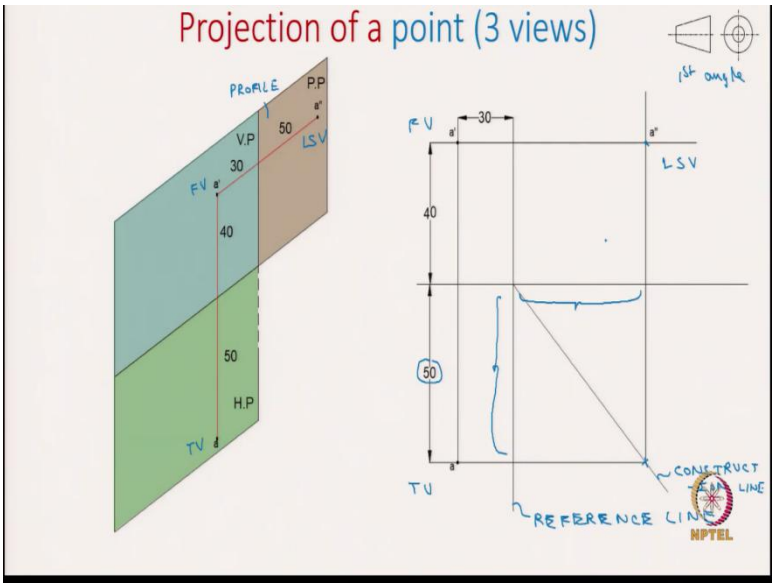

So, now let us start with the top view. So, we rotate the horizontal plane clockwise by 90 degrees and similarly, we open up the profile plane by 90 degree such that it falls in plane of the front view. So, now we have the front view, top view and the left side view.

So, as we all know for a first angle projection, the left side view will be placed to the right of the front view that is what we see here but this is all pictorially shown just for visualization purposes but now let us see how we develop it on a paper or draw it on a paper. So, we start with the reference line, then capture the front view then use a projector to capture the top view. This we have seen previously.

Now for us to draw the side view, we will now again draw a second reference line which is perpendicular to the initial line. So, this again is a reference line which is perpendicular to the other reference line and we use a technique where we can capture the dimensions in the top view which will help us to draw the side view. For that, we use a technique where we draw a line which is at 45 degrees in the fourth quadrant.

So, now let us see how we can use this inclined line to capture the dimensions from the top view. So, for that we use a projector line. So, for example here from top view A, we draw a horizontal line until it intersects this inclined line. This is some construction line. So, we said we have drawn this projector line from top view which intersects with this inclined line and then draw another projector line in the vertical direction.

By this what we are trying to do is, let us say this is the 50. 50 is the distance from the reference line to the top view, the same 50 which is shown here is also captured here

because of this 45 degree angle line. So, now once we draw another projector line from the front view, we know the intersection of these two project lines will give you the side view.

So, side view we are representing with a double prime. By this, we are able to show the front view, top view and the left side view of a single point by using the first angle projection. Now, let us quickly look at how do we do the same projection of a point in the third angle projections?

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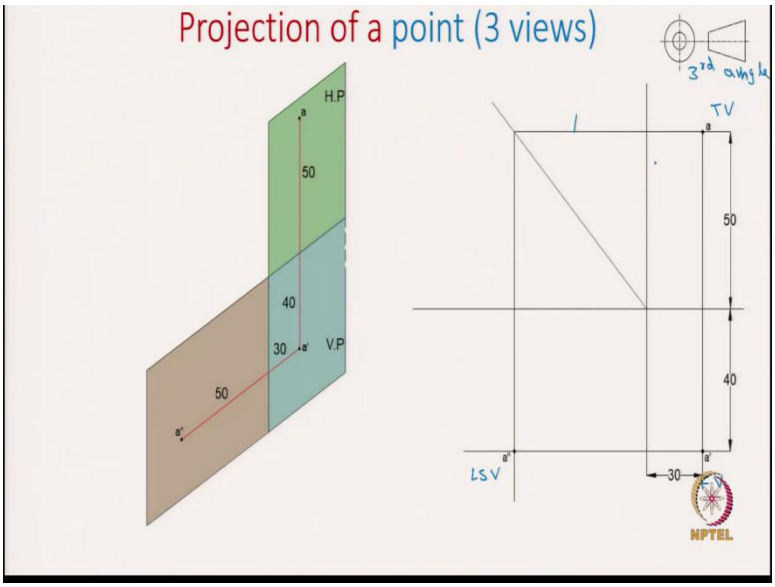

So, now we have this point which is placed at a distance of 30, 40 and 50 from the three projection planes. Now, let us capture the three views. So, we have captured here the top view, front view and the side view. A double prime is for the side view. So, now let us open up the plane so that all of them lie in a single plane. So, we first open, rotate the horizontal plane and bring the top view in line with the front view. Similarly, the profile plane we rotate so that the side view is in the same plane as the front view.

So, this is the pictorial representation of what we are doing but now let us show it on a drawing sheet. Starting with the reference line first capture your front view and then draw a projector line to capture the top view. Now, we said we will be using a second reference line perpendicular to the first reference line and then we will also use this technique of capturing dimensions from top view to the side view the way we do it is by using this 45 degree line. So, then we use the projectors to capture these dimensions.

So, this projector captures the dimensions from the top view onto the side view. Similarly, we use another projector from the front view, the intersection of which will give us the left side view. As we know with third angle projections, in the third angle projection the top view is placed above the front view and left side view is placed to the left of the front view that is what we see here. The reason why we are showing these simple things of a point is just to illustrate the point that how do we capture the side view using the information from front view and top view.

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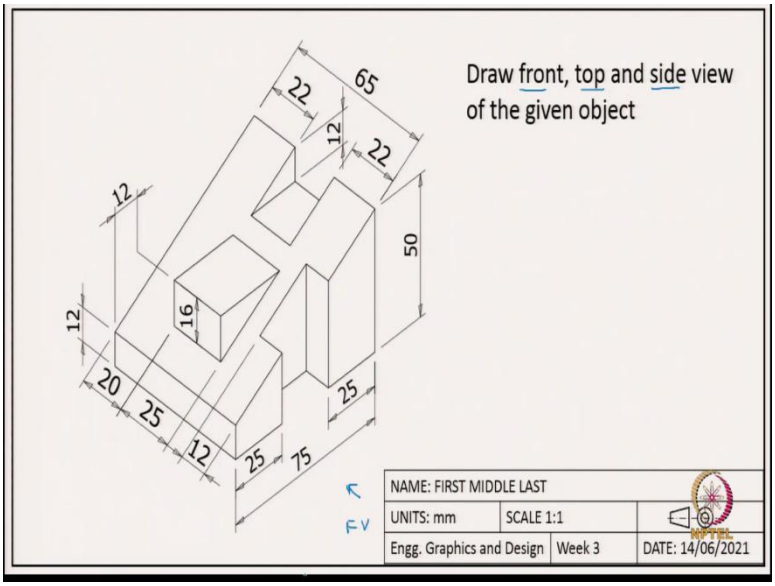

But now let us get into projections of a simple object for example the object we are looking at is this. Here we see an isometric view or a pictorial view of this object with all the dimensions. So, what is it we are asked to do? We are asked to draw the front, top and side. So, here is the object which is shown on the slide.

So, as we said we first need to make a choice of which view we will take it as the front view. So, depending on number of features we can capture, let us say that this view we will call it as the front view. For example, here with an arrow we can show that this is the, this arrow shows the direction for capturing the front view. And for this object, let us say, we need three views so that is what is asked and that is what we will try to develop.

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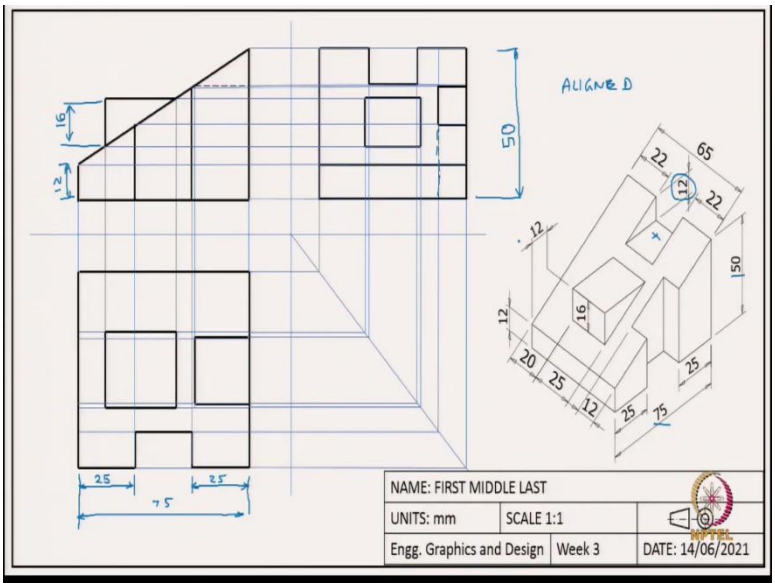

So, here is a drawing sheet where we have the pictorial at one corner of the sheet. Now, we will try to capture the front view, top view and the side view step by step so that you can follow how usually we start with engineering drawings. So, usually the first step in drawing is first you capture what are the overall dimensions of this object.

So, for example, if you are looking at the front view you need to capture what is the overall width of the object and overall height of the object. So, looking at this isometric view you know that the width is 75 and the height is 50. So, now let us get started. If you are looking at this object what are the things you will be seeing? You will be looking at this face and this face, as well as this face. So, you will be looking at these three faces and that is what we will try to capture first. So, let us start with the bottom edge.

Though there is a break here but still if you are looking at the front view it looks like one single line and what is the length of this line? We know it is the total width of the object which is 75. So, what is next? So, after this you look at this edge to the left and the other edge to the right and these dimensions are already given. So, the smaller edge is height 12 and the longer edge is the overall height which is 50. So, once you have this left edge and the right edge, next what do you do?

So, we just need to join these two points to get this inclined line. So, now we got the outline of this object but is that everything we see? We also see these edges because there is a cut, there are two surfaces meeting at a edge, we need to show this edge. We see edges one and two and since we know the dimensions, we can draw those two edges. But in addition to this, we also see this small triangular thing which is sitting on this inclined surface.

So, in the front view what do we capture? We capture a single triangle and what information do we know about this triangle? We know that the height of this edge is 16 and the other information we know is this vertical plane is at a distance of 12 from this vertical plane. So, we capture this distance 16 and then the horizontal surface. We do not know the length of this horizontal line but if we draw a horizontal line wherever it intersects this inclined plane, that is where it ends.

So, now we are able to capture the front view, all the visible things we have captured this face, the second face as well as the third face. Is there any feature which is hidden? The answer is yes. So, there is a slot here on the top, the slot here is not visible in the front view but it is a hidden feature.

So, how do we show it? Using hidden lines or the dashed lines. So, what do we see in this about this hidden feature? What we see is only a straight line and what information do we know about dimensioning of it? We know that this distance of 12 tells how far it is from the top edge.

So, using that we draw a straight line. So, as we all know for the outlines we use thick lines whereas for the hidden lines we use narrow or thin lines and we use a dashed line to say that it is a hidden feature. So, this completes the front view. So, we have captured each and every detail of this object in the front view. Now, let us move ahead and draw the top view. So, while drawing the top view we already know that the width is 75 which is already captured in the front view so let us take that information to draw the top view.

So, we use these two projector lines and then I, so when you are looking at the top view there are three things which are very clear. So, this edge is a straight line, this edge is a straight line so if you are looking at top view this is what you see. So, this is a straight line, this is a straight line and this is a straight line though it is broken in the middle it is still a straight line.

So, I cannot draw the bottom line because I know here there is a slot. So, that is why I left it without drawing the outline. Now, let us see what are the other information. So, I will draw few more construction lines or the projection lines which will help me define this bottom slot. So, after that I draw the outline.

So, now I am able to capture this slot because I know what is the height of this slot which is given as 12 units and using the projection lines, I am able to completely define this slot. So, what else do we see in the top view? We see this small triangle thing as a square or a rectangle and the dimensions of this rectangle that we can get from the front view.

So, what is the length we get it from the front view projectors and what is the width which is already given in the drawing, it is said that the width is 25 and it is at a distance of 20 from one of the edges. So, with this now we are able to capture this rectangle. So, what is the other feature you will be able to see? You will also be able to see this rectangle. So, because this is a planar surface and you should be able to see all the edges of this rectangle. So, how do we dimension that?

Again, we use the help of the front view. So, for example, this hidden line we take a projector and then using that projector we are now able to draw the top view. Great. So, with this we are able to draw all the features of the top view and there is no hidden feature left in the top view. So, there is no need of any dashed lines. So, until now we are able to capture the front view and the top view.

What is now left is the side. So how do we proceed? We first draw the second reference line perpendicular to the first reference line and then we use this technique of the 45 degree line to capture the dimensions from the top view. So, now we will use all the projectors onto this 45 degrees line and then we use another set of projectors vertical so that all dimensions in the top view are captured. Similarly, we use other projectors from the front view and the intersection of these projectors from both the front view and the top view will help us draw the side view.

So, now we said this is the front view and this is the top view and now let us say this is the side view. So, let us say you are looking from the left which is the view so what is it you will be looking in the side view? You look at this face you will also look at this face but it will look like a rectangle though it is inclined, in the side view it will look like a rectangle and similarly you will be looking at this face. Here you see that there is a slot that is what you will try to represent in the side view.

Finally, you see that this slot part of it you can see and part of it is hidden. So, there is some hidden features also we need to capture in this side view. So, let us get started first the easiest thing to do is to start with this face and the rest. So, I have covered this rectangle and drawn the vertical lines this edge as well as these edges.

And then I need to capture this slot since I know what is the from the front view I know what is the depth of it, I can draw that slot. Next how do I capture these dimensions? Again, I use the information from front and top view to draw this rectangle and lastly these features, so again I use the projection lines to draw this slot.

So, this slot I will first look it as a small piece of rectangle and lastly for example this edge you cannot see it in the side view but that needs to be represented. How do we capture that? We capture that using the hidden line probably it is not shown so clearly here but what I try to do is there is a hidden line here.

So, with this we complete the side view. So, what we do after capturing the views is we need to dimension it. So, for example, if you are looking at this pictorial view, we see that the dimensions are done in an aligned fashion. So, I am just trying to recall what is a aligned way of dimensions here we have that the text is follows the direction of the dimensional line.

So, if the dimension line is vertical your text is vertical and if your dimension line is horizontal your text is also horizontal and usually the dimension value is placed above the dimension line. So, for us to dimension these views so first let us say what is the dimensions here. So, here we say it is 25, we need to place the text above the dimension line.

So, here to it is 25 and the overall width is also needs to be dimension which is 75. So, again you can use the same method to show that the height is represented by 50 and similarly this distance is 12, similarly the small triangle thing also has a dimension. Here

we know that the height of it is 16 so that also can be shown. I am not dimensioning it completely but you get it.

So, after your dimension then it completes a complete engineering drawing where we show the pictorial view as well as all the three views which are the front, top and the side view with the complete dimensioning. So, either you follow the aligned system, unidirectional system you should be consistent with throughout the engineering drawing.

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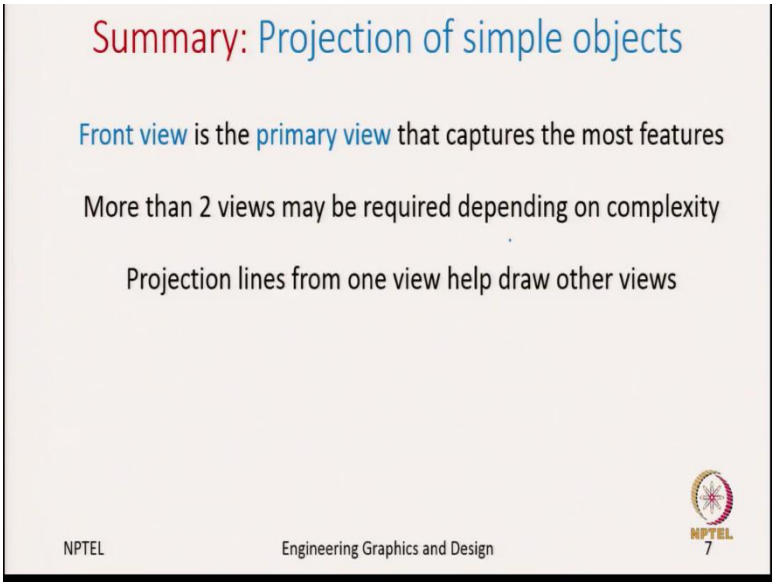

To summarize what did we learn in this lecture is how to start by projecting simple objects. The first and foremost thing to do is you need to make a choice of the front view and when you make that choice, we keep in mind that we should be capturing most of the features in the front view. And then depending on the complexity of the object you need to say whether you need two views, three views or more than three views and maybe as I already said basic views may not be sufficient for some complicated objects.

In that case you may have to use some things like auxiliary views or section views. And lastly, the whole point is after you are done with one single view it can be a front view or a top view the dimensions from this view can be used to develop the other views, this way you can use the projector lines to help you develop other views in an easy fashion.

So, what we will be doing after this is we will show it on a paper, in the next lecture we will show the same drawings on a piece of paper where we do it with a pencil and paper instead of slide so that this is exactly like how you practice and learn how to do these projections.

So, before I end this lecture the last point of advice is engineering drawing is more of practice the more you practice you get to know better and you feel more comfortable with the materials. So, I would encourage all of you to practice it with a couple of objects until you feel more confident in developing these different views.