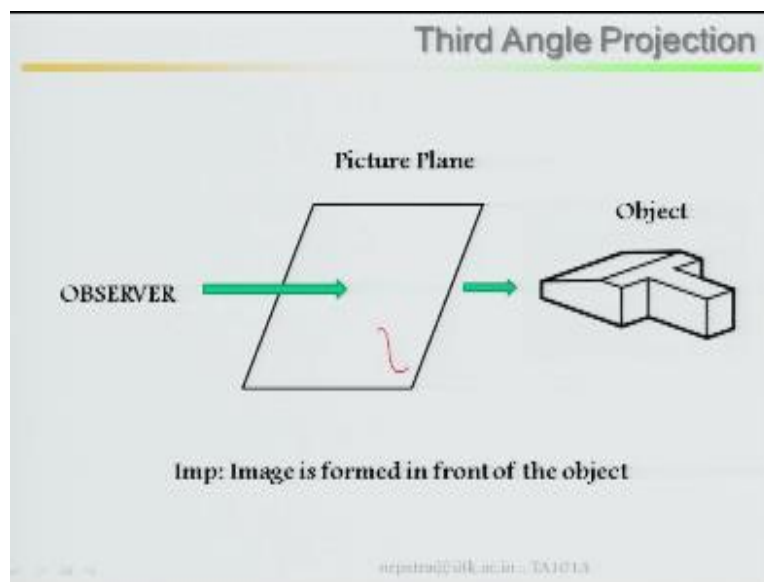


Indian Institute of Technology Kanpur
National Programme on Technology Enhanced Learning (NPTEL)
Course Title
Engineering Graphics

Lecture-05
Orthographic Projections-Part II

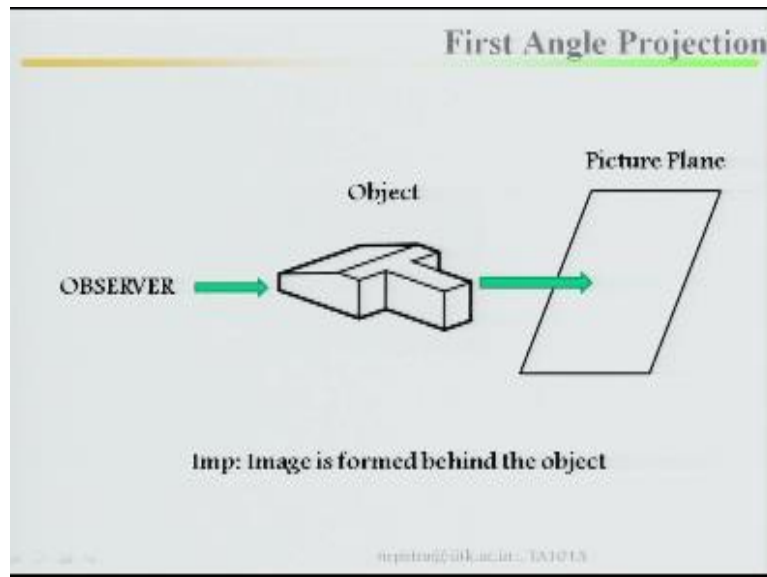
by
Prof. Nihar Ranjan Patra
Department of Civil Engineering, IIT Kanpur

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Last class so we have covered difference between Third Angle Projection as well as First Angle Projections, just our repetitions, third angle projections if you look at images front formed in front of the object. Observer is fixed so image it is formed in front of this object, this is your image.

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Then first angle projections image is formed behind the object, this is the two basic difference I have started in engineering graphics.

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More on Third versus First!

- The difference in the third angle and the first angle projection methods is mainly in the relative positions of the picture plane and the object.
- The position of the observer remains the same.
- All the principal views (e.g. top, front, and side) would be identical whether you draw them in the third angle or the first angle scheme.

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So if you look at here I have also covered this, the position of observer remains same. Observer position is remains same.

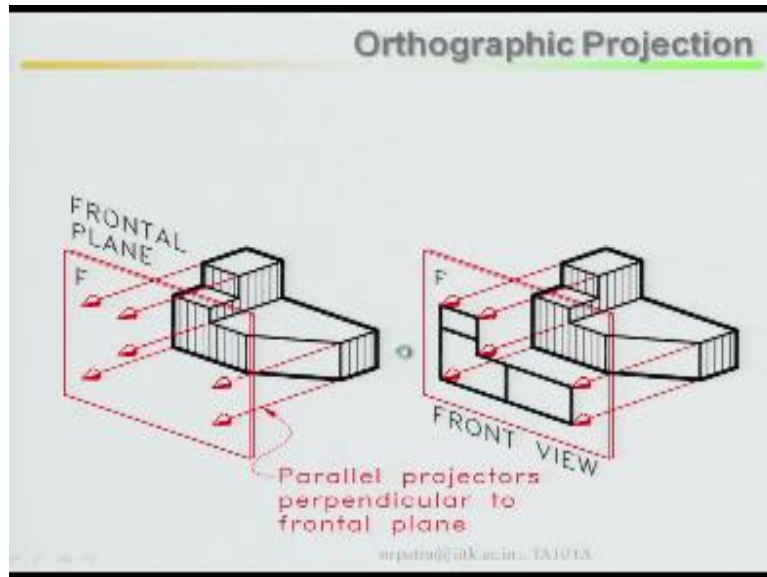
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Third versus First!

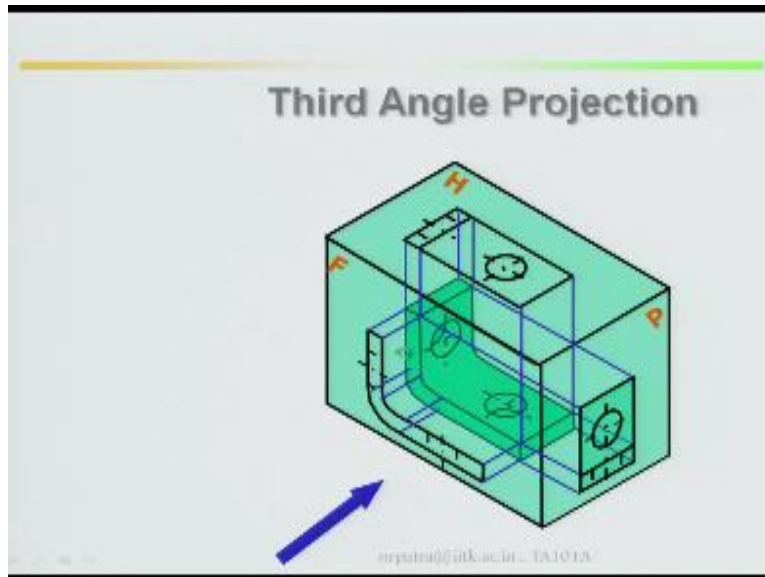
How to remember?

- In the first angle, object is encountered first (by the observer).
- In the third angle, the object is third (among observer, picture plane, and object).
- This would help in drawing the different views in their correct positions.

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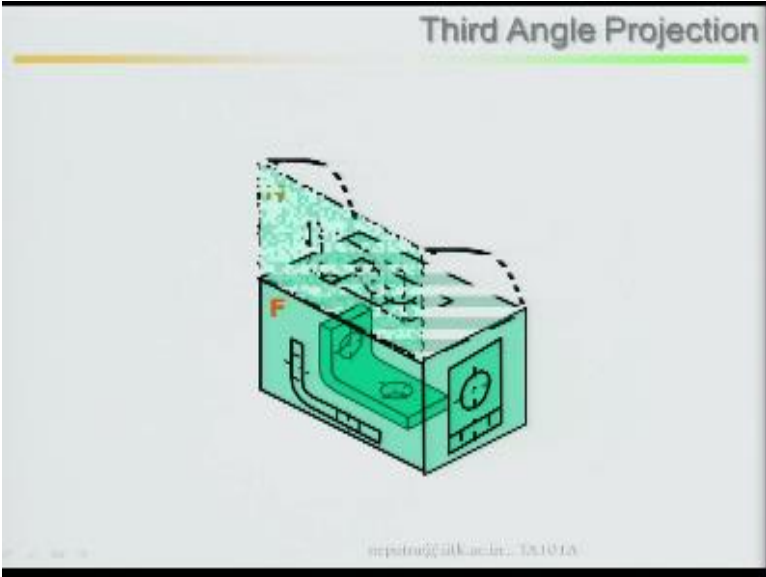


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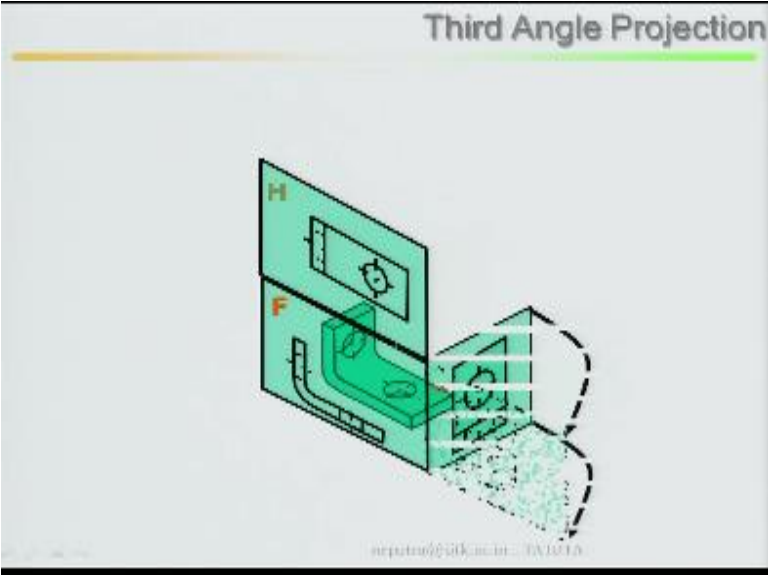


Then I have covered this third angle projections, how you will start it.

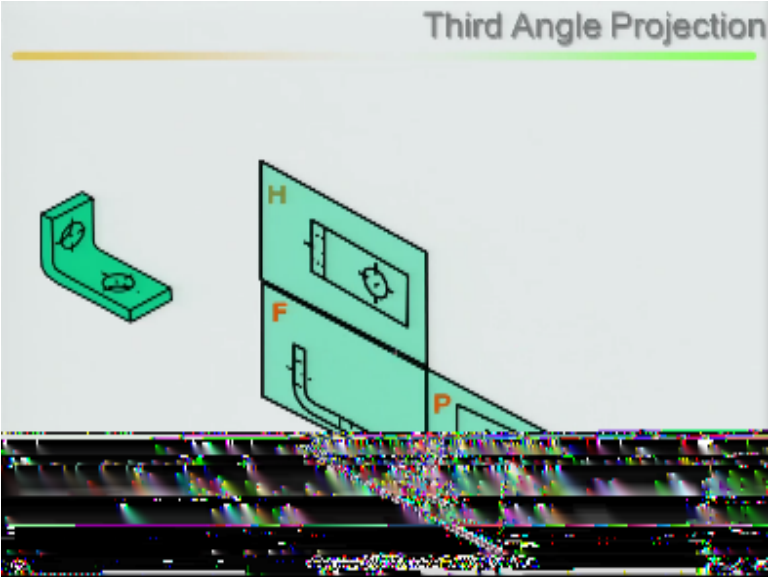
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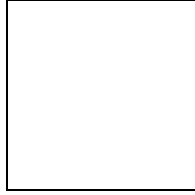


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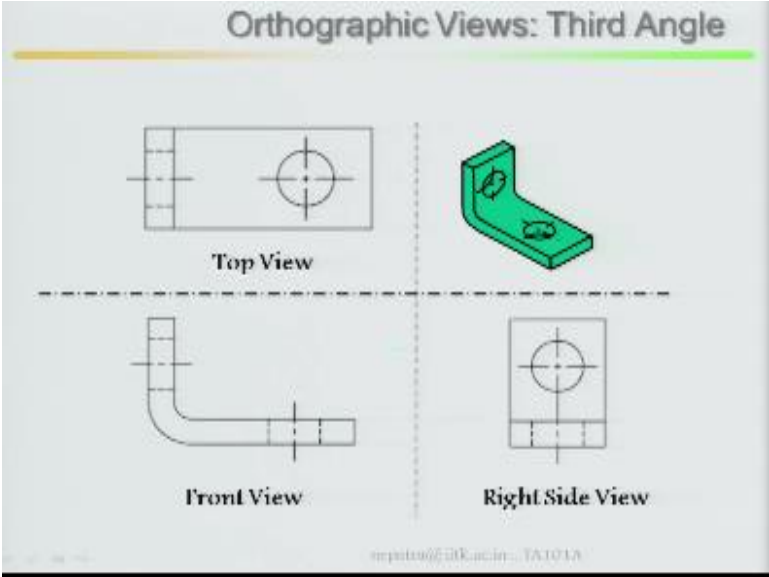


Then just in review how the object we know how it has been rotated.

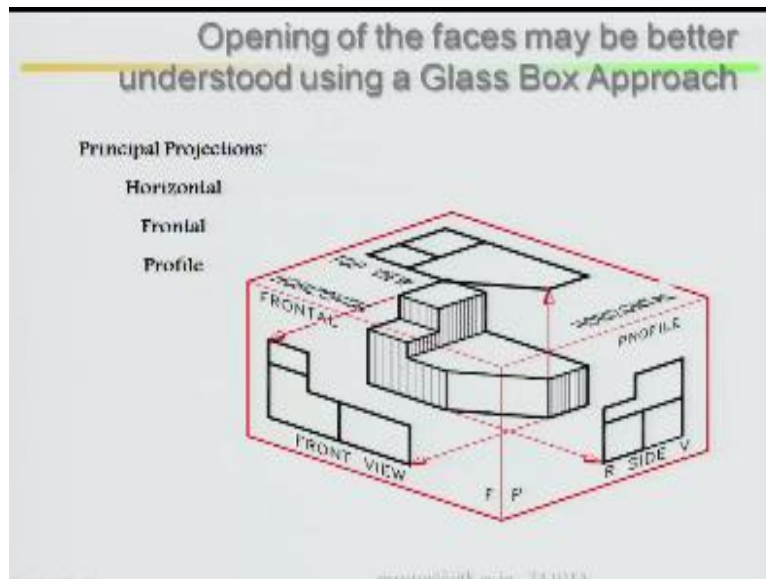
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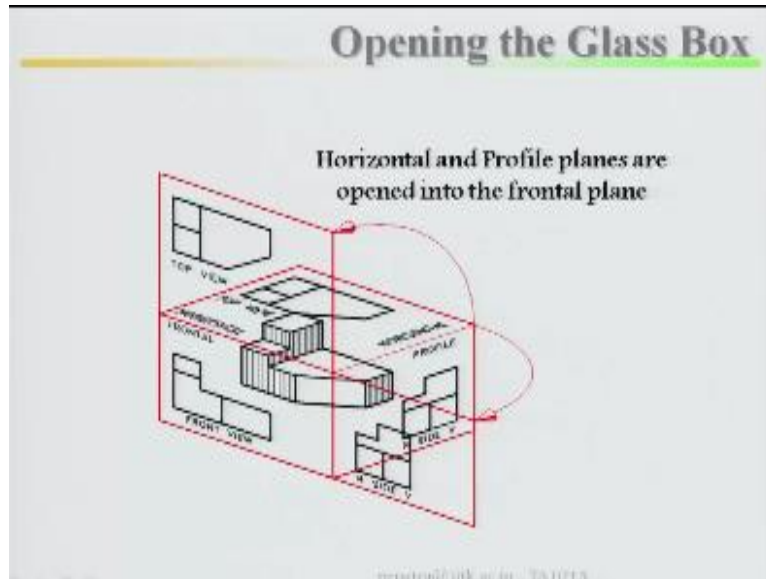
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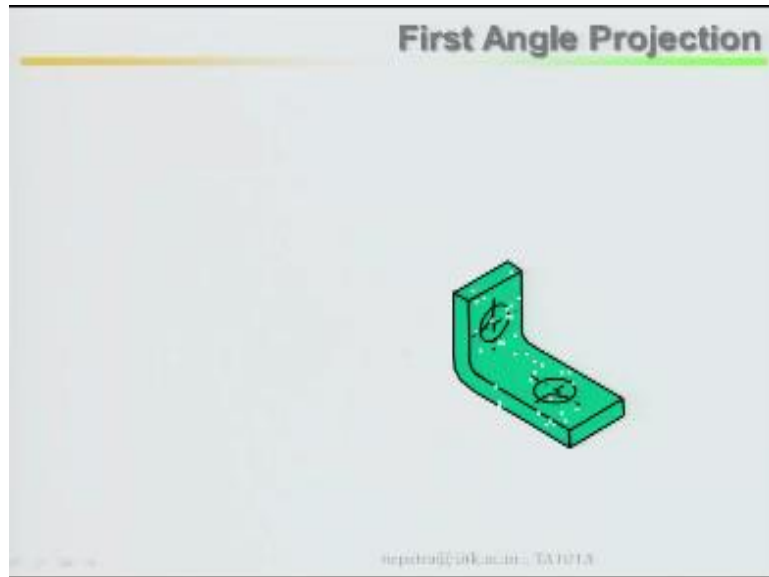
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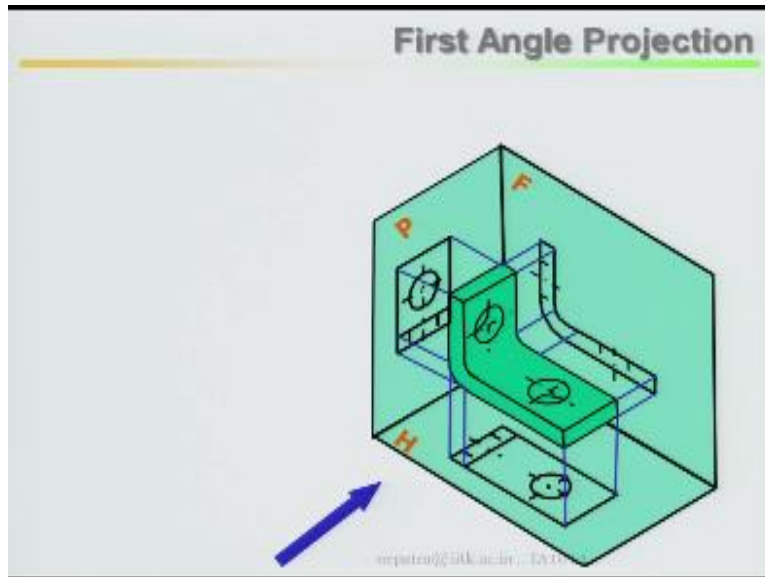


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3D object view, and this third angle projections up to this I have covered.

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Now let us start with first angle projections. Look at this object, this is the view point where this – this is your object where we are visualizing the view. The side where you are viewing that is your view, observer is here. Now this is your frontal plane, that means in first angle projection what is the difference, object is formed, means image is formed behind the object. So in case of first angle projection this is your object, this is your object.

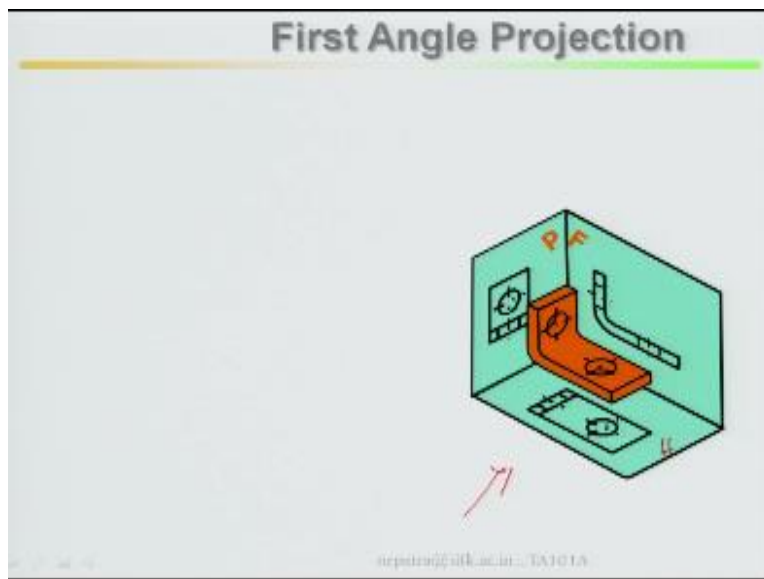
So image is formed, image will be formed behind the object that means this is your – why I called it frontal plane, because view is here that means I am seeing here, that side it is your frontal plane that means this will come as a front view. And this is your horizontal plane, this bottom part is your horizontal plane, because it is parallel to horizontal and frontal plane parallel to your vertical.

So this is your horizontal plane, now this is your profile plane, profile plane as I said earlier profile plane means these are all your side views whether it is your left side view or it is your right side view, this is called your profile plane. Now let us look at these first angle projections, so looking at this object, I am looking at this object from this side, so what will happen it will be projected in frontal plane.

Once it will be projected in frontal plane this part and this part will merge, this part and this part will merge, that means in frontal plane this part will be nowhere else. So similarly I just projected this rays, that means this coordinate, this coordinate it has been projected it is coming here, this coordinate, this coordinate it will be projected it is coming here, like this the front view has been drawn, then similarly profile view or side view has been drawn.

This is the profile view, what happened in the profile view if we look at here this will merge as one point, because you are looking from this side and this and this will merge, so again this, this will merge, this, this will merge. So it will be coming only this view. Similarly your top view, top view means you are looking from the top, you are looking from the top, so in this case I am looking from the top with here, it will place in your horizontal plane, so same way the top view has been projected.

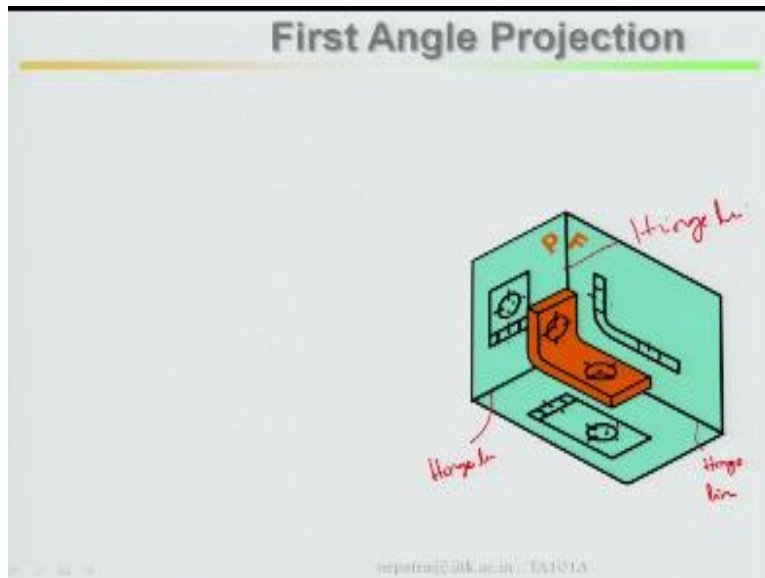
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So if I look at here this is the object, I am looking from this side and in first angle projection once again your image is formed behind the object, that means this is the object image is formed behind the object, this is called your – because I am looking this object from this side, so this is

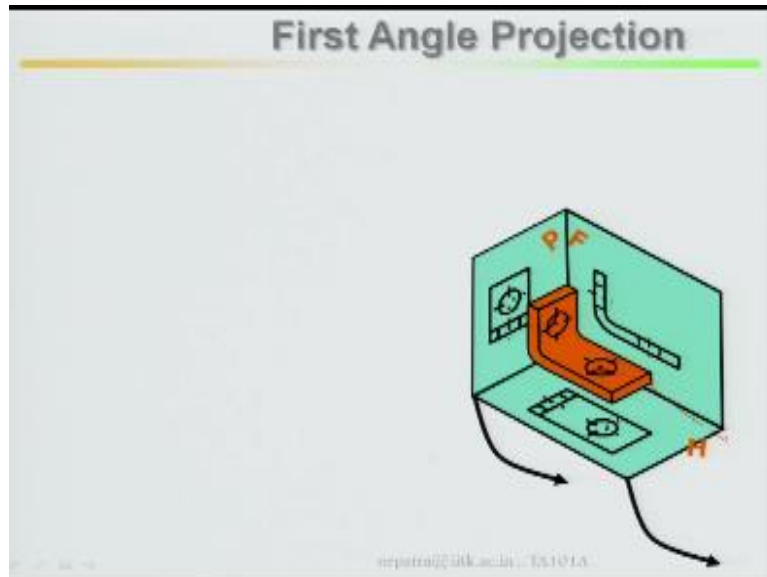
called your frontal plane. And from the top you are looking at this, this is your horizontal plane called top view and this is your profile plane called side view I am looking this side.

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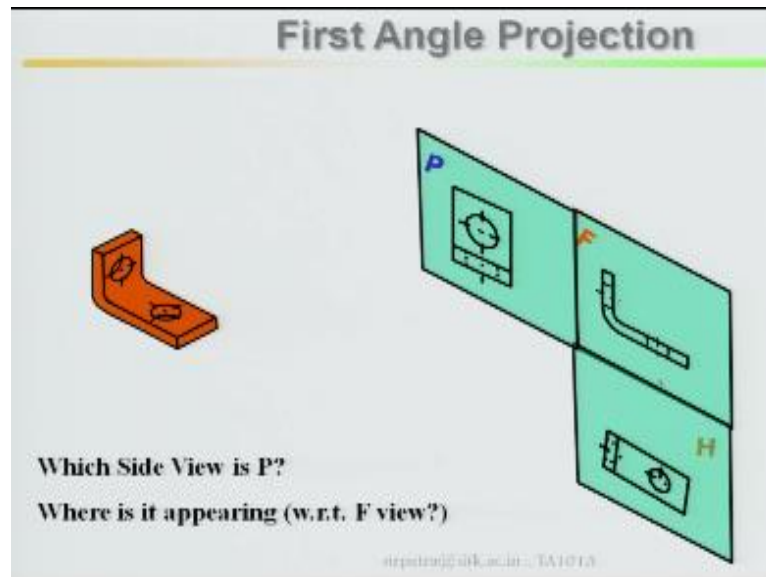
Now how to rotate this, now you have to – these are all your three dimensional that means inside a box. Now I have to plot in a two dimension, in two dimension. Now as I said earlier these are all your hinge lines, this is your last class I said, this is your hinge line, hinge line, and this is your also hinge line, this is your also hinge line, hinge line.

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So with respect to hinge line it has to be rotated back so that it will be shown in two dimensions. In a simple paper form, so it has been rotated here look at the rotation, all the rotation with respect to front view as I said last class, whatever the rotation has been made with respect to front view, so if this is my front view this is the hinge line, with respect to front view your horizontal plane will be rotated, that means your top view will be rotated. That means rotated along this hinge line.

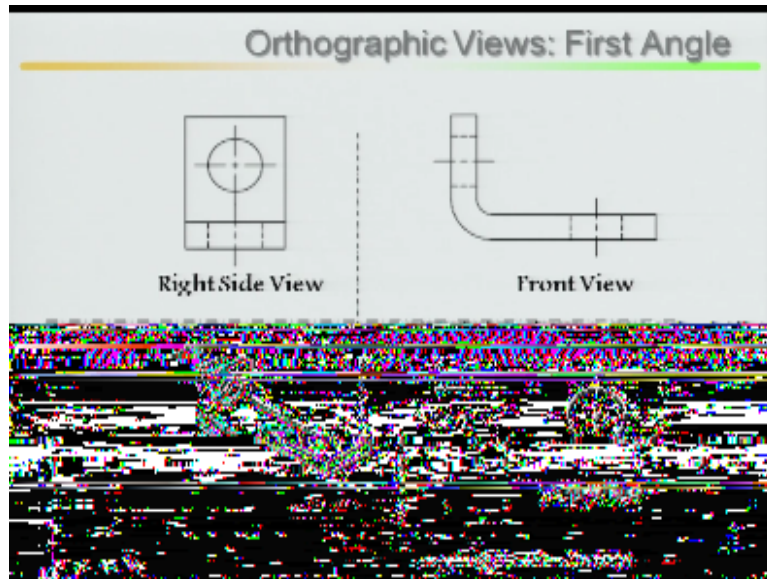
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Now this is your horizontal plane that means this is your top view. Similarly profile view which part it will be rotated with respect to what, with respect to front view that means it will be rotated along this hinge line. So now it has been rotated along the hinge line. So this comes to your picture, this is your front view, this is your top view, this is your profile view. Now which side view is P?

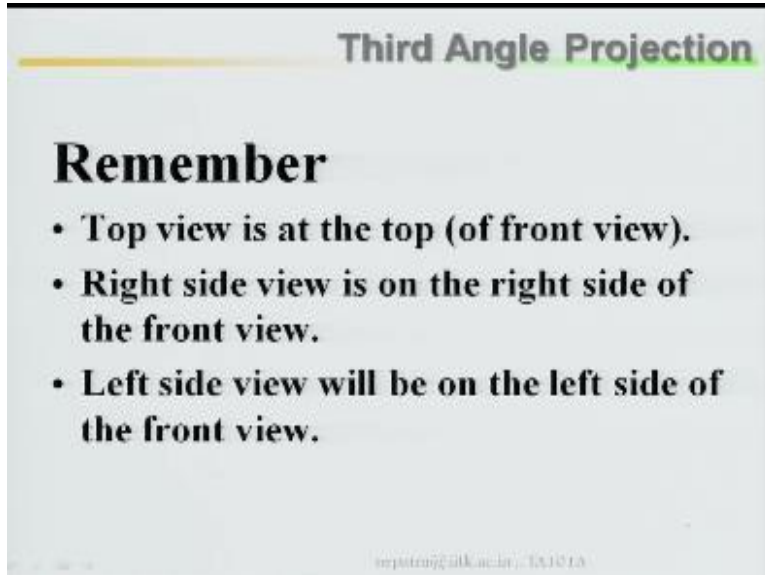
Tell me which side view is P? Whether it is a left hand side view or right hand side view? It is a right hand side view, generally profile view with respect to front view we have to do, because the rotation has been made with respect to front view, that means we are looking from here front view with respect to right side we are rotating.

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First angle projections, front view, top view and this is your right side view, this is your right side view.

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Third Angle Projection

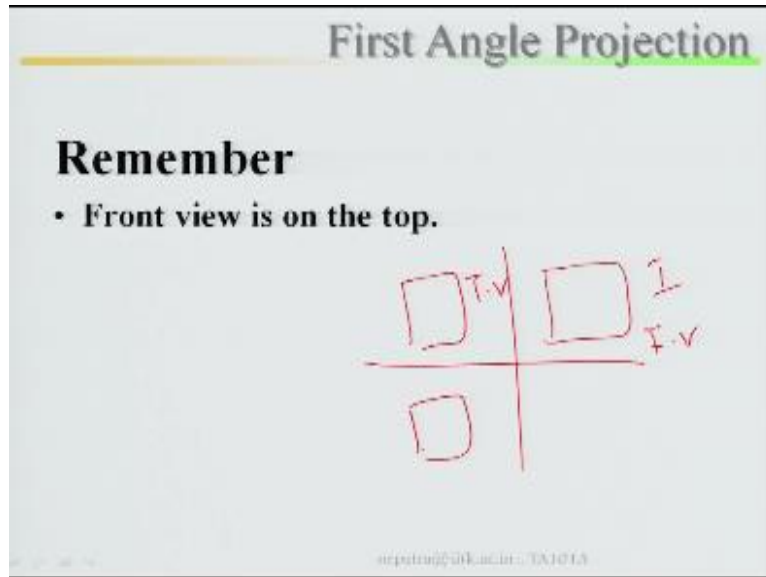
Remember

- **Top view is at the top (of front view).**
- **Right side view is on the right side of the front view.**
- **Left side view will be on the left side of the front view.**

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Third angle projection remember, top view is at the top, that means top view is at the top means in third angle projection top view will be top, front view will be at the bottom. Right side view is on the right side of the front view, this is your third angle projections. Left side view will be on the left side of the front view.

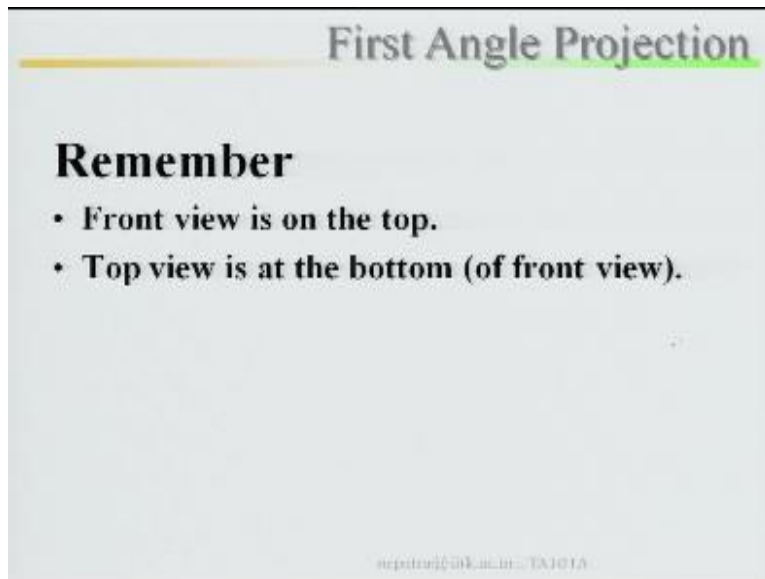
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In first angle projection remember front view is on the top, the basic difference between third angle projection as well as first angle projection is that in first angle projection front view is on the top. If I put a quadrant like this, if I put a quadrant like this, if I draw here, if I say this is my front view, sorry I can put it here also, quadrant here, because this is nearly a first quadrant. If this is say, if I say this is my front view that means obviously this is first angle projections, this is at the top.

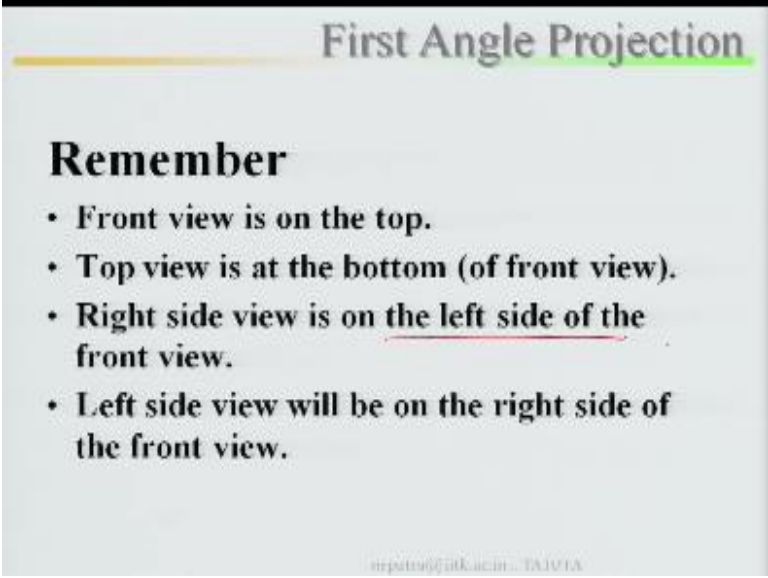
Then top view will be at the bottom. In case of third angle projection what will happen, this is your first angle projection. In case of third angle projection this will be your top view and here it will be front view. This is the easy way of remembering so that you do not do mistake while in examination.

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So top view is at the bottom of the front view in case of first angle projections.

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First Angle Projection

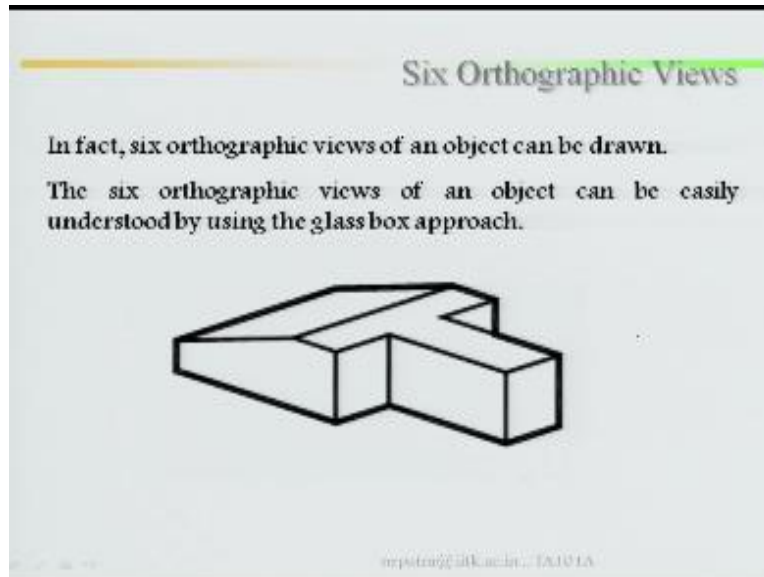
Remember

- Front view is on the top.
- Top view is at the bottom (of front view).
- Right side view is on the left side of the front view.
- Left side view will be on the right side of the front view.

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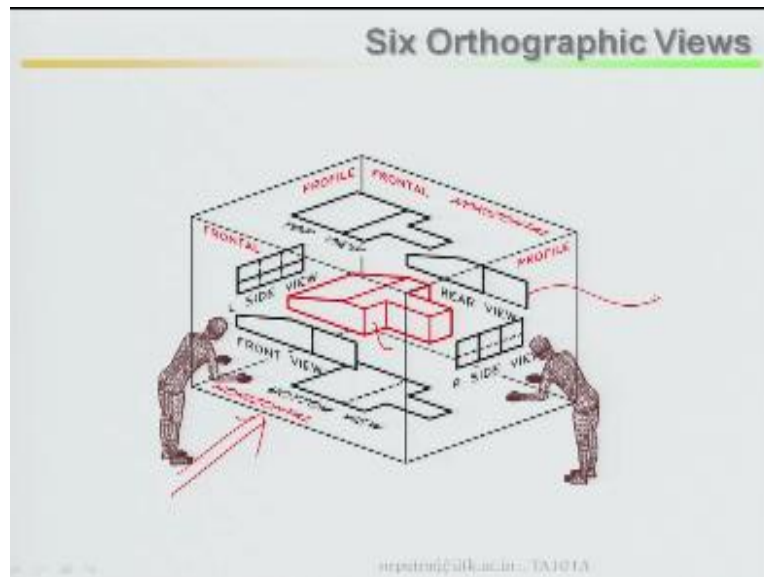
The right side view is on the left side of the front view, this is another difference. Right side view is on the left side view of the front view and left side view will be on the right side of the front view.

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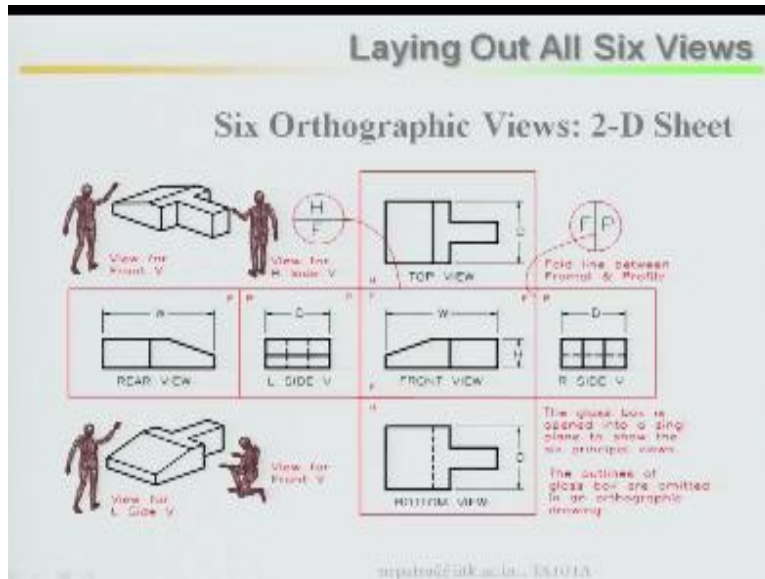
So there are six orthographic views, in fact six orthographic views of an object can be drawn. The six orthographic views of an object can be easily understood by using a glass box approach, glass box approach. Six views we are converging into only three, there are six views we are converging into only three front, top, as well as other of the either left hand side view or right hand side view, three views, side view, front view and top view, but we can have six views also.

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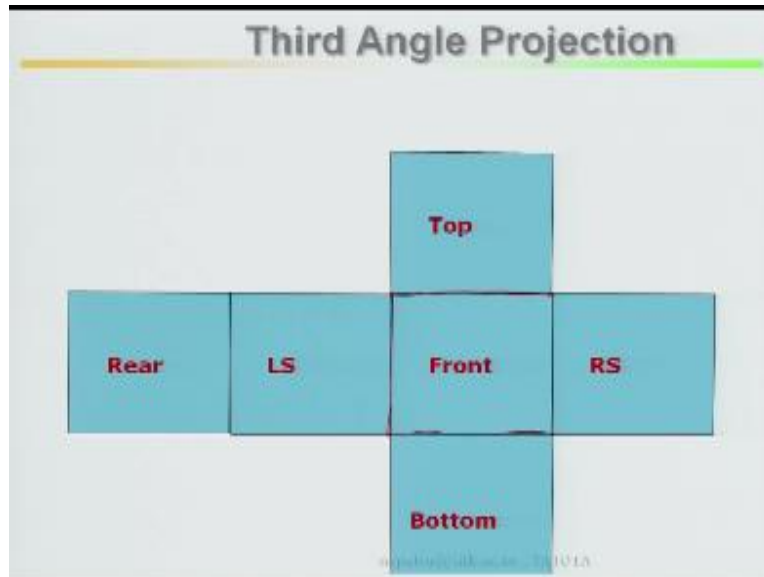


Look at the example here, there is a box, there is a box. If I go by third angle projections that means this is my object, this is my object and I am looking from this side, this is the observer. So this is your top view, here is your front view, here is your right hand side view, here is your left hand side view and this part is your rear view, this is your rear view and this is your bottom view.

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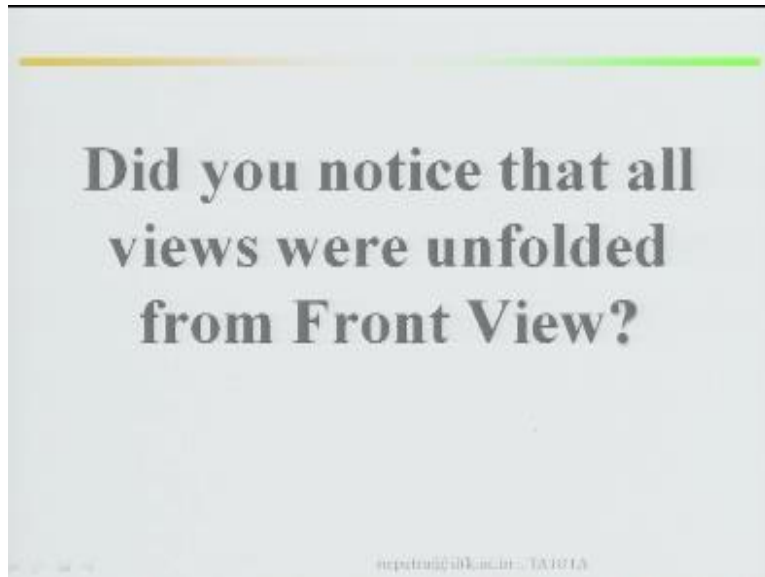


So if we look at here let me go to the glass box that will be better way. Look at the glass box first part with respect to front view I rotate it. This is my hinge line with respect to front view I rotate it, right front view are looking like this object, this is the third angle projections looking like this object and in this object in the front view this will be my right hand side, this will be my right hand side and this is the hinge line.

It has been rotated and it is right hand side view. Then similarly if you look at here rear, left hand side view all together rotated along the – with respect to front view. So I rotate it back with the left hand side view towards the left in case of third angle projections, look at here. So rear view is coming here, that means front view, left hand side view, and this is your rear view. Similarly top view, top view with respect to what?

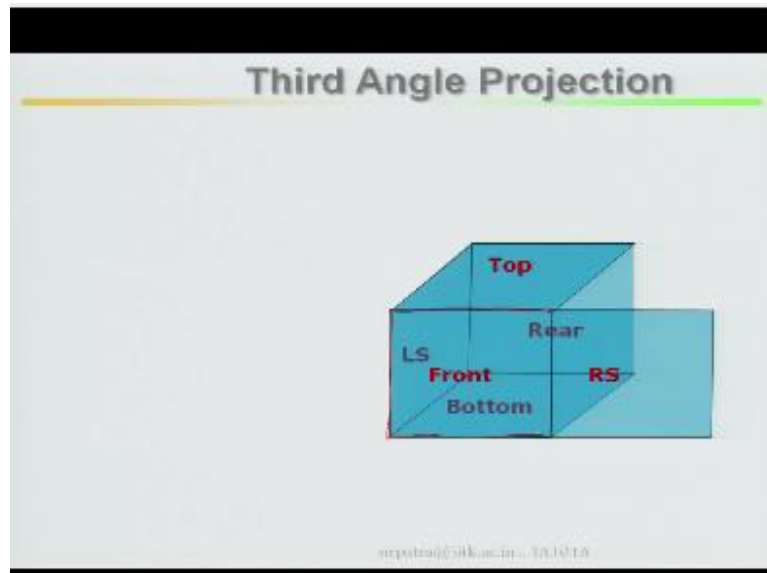
Top view with respect to front view and along the hinge line here, so it has been rotated. Now this is your top view, bottom view will be with respect to front view and along the hinge line here. So here it is your bottom view. Now 1, 2, 3, 4, 5, 6, you are getting six orthographic views just I started this third angle projections.

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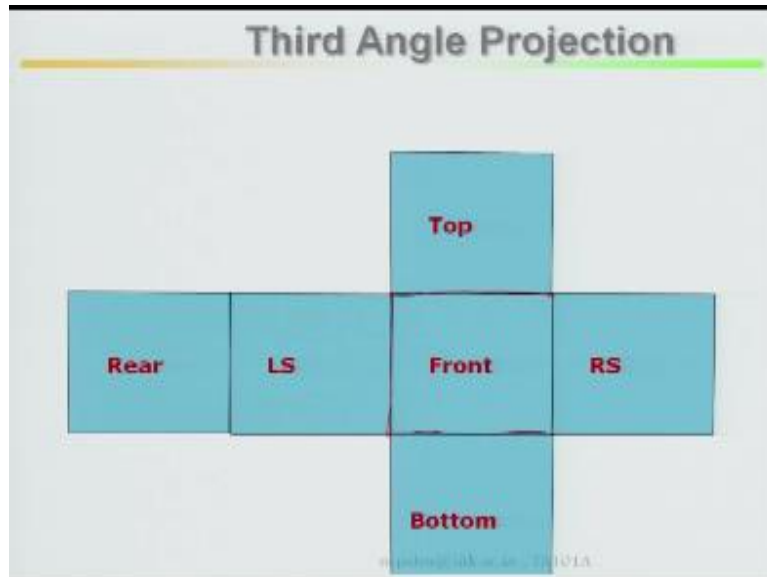
Then do you notice that all views were unfolded from the front view.

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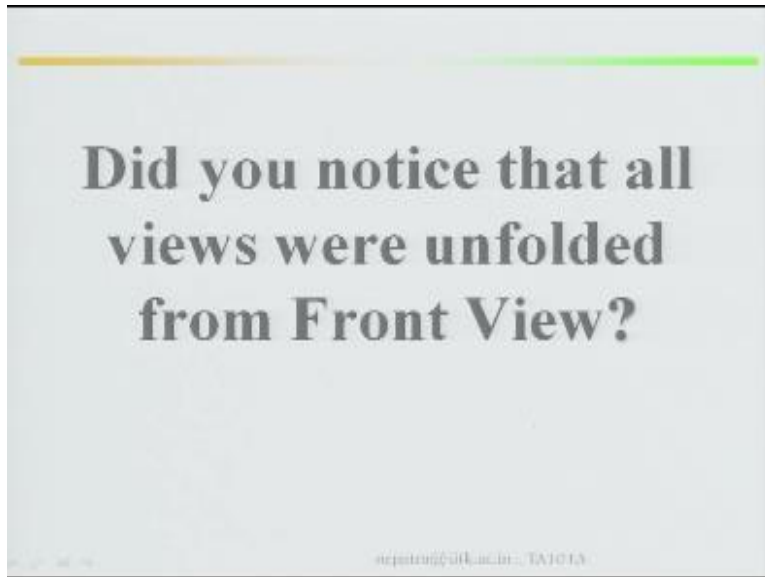
Remember whatever views you are doing, if I repeat it again this is a glass box 3DQ, all the views I rotated with respect to front view. In this case of third angle or first angle front view is stagnant.

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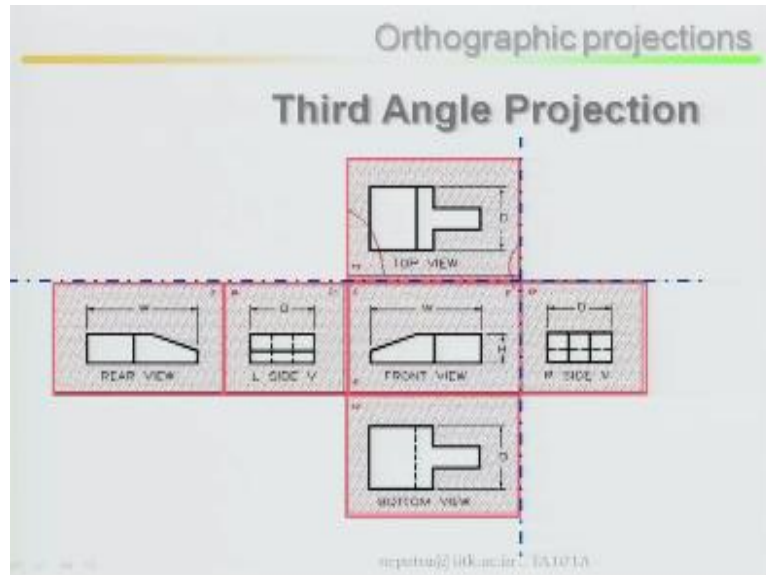


With respect to front view it has been rotated, so here with respect to front view it has been rotated. Now bottom view also, rear view also, top view also rotated with respect to front view, bottom view also rotated with respect to front view.

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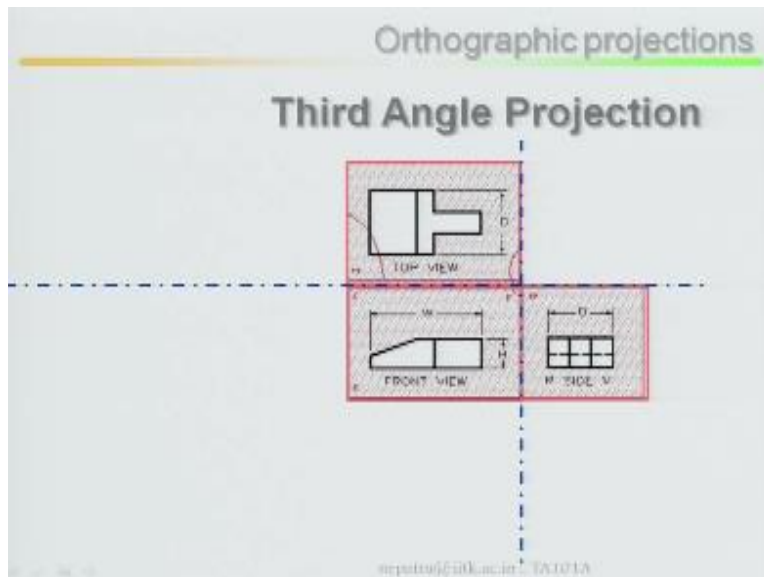


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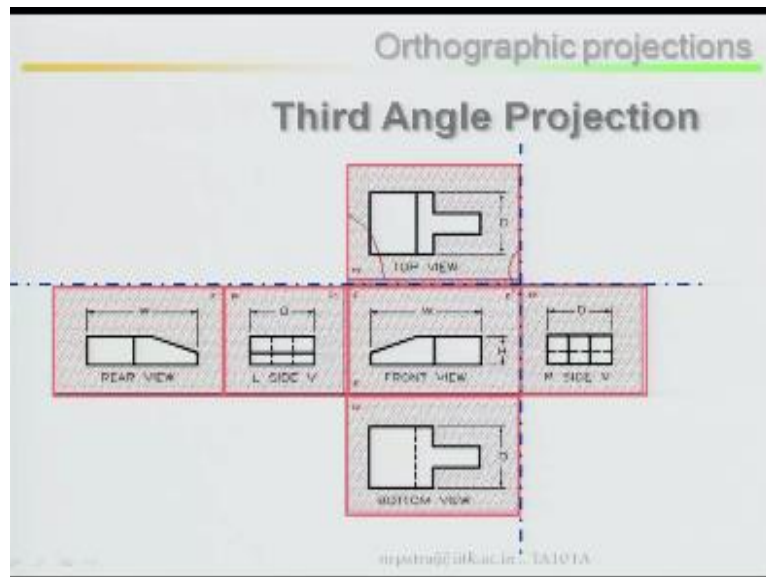
Now you are supposed to get in case of third angle projections, top view, front view, bottom view, right side view, left side view, rear view. So more importantly out of this six we use generally this is my hinge line, this side is called horizontal plane, this is your vertical plane, frontal plane and this is your profile plane with respect to this. So I can remove, I can remove bottom view, left side view, and rear view.

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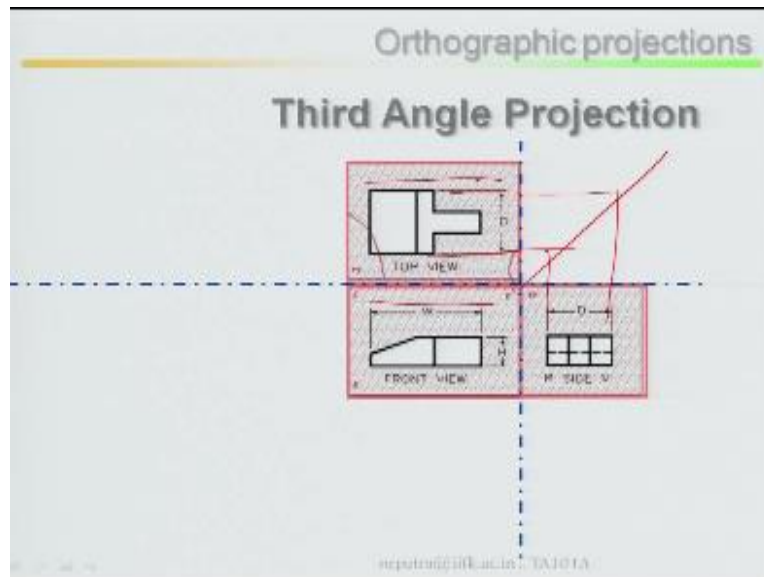
Some complicated images for particularly normal images three views are sufficient. Why we are looking at the three views, three views are sufficient to describe the object, what are the things inside, how it looks, what are their dimensions, necessarily three views are required.

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But however certain cases, certain cases complicated cases you need to have additional three views also. So in general you need to have to have at least three views to describe the particular object, but some cases there is a complicated, maybe there may be a complicated object. So getting this real picture you need to have to have also another additional three views.

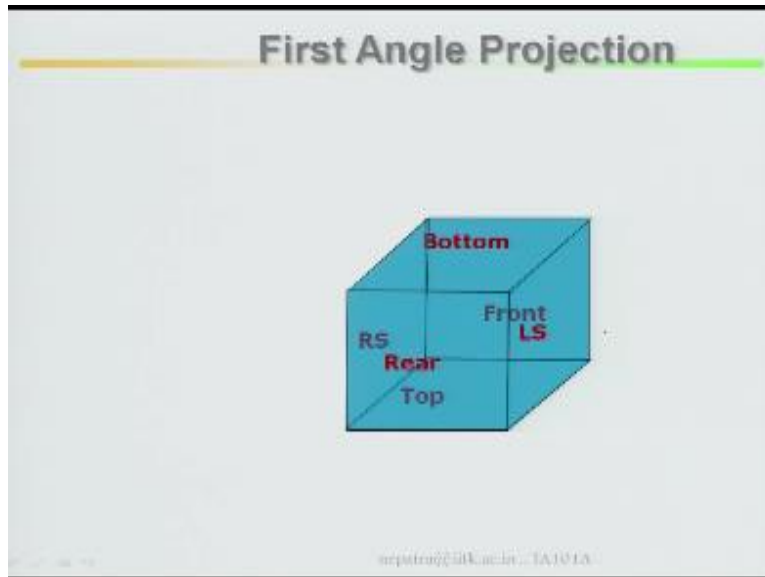
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So generally we remove this three views, remember bottom view either right hand side view or left hand side view and rear view, generally we remove it. So this is your picture of your third angle projections, top view, front view, right hand side view. If you look at the top view, your depth is looking at here, and this is your height, this is your width. Width and height, width and height is coming in your front view right.

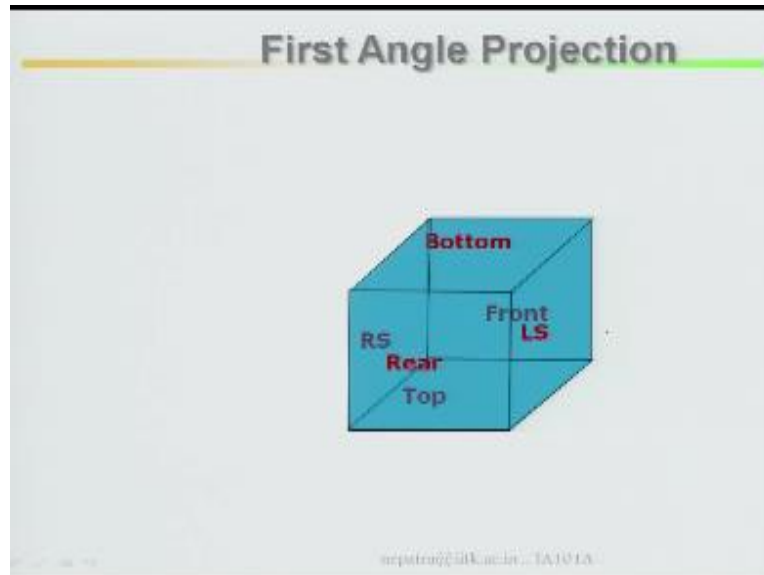
And depth is coming at your top view, because same width will be continuing here the same width will be here, same width will be here. Then here depth will be there, the depth once you are going to bring it back, generally if you know the depth either this side if you know the top view depth, then what happen you can project it back, you can project it back here. So in the side view we can get your depth also.

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Start with your first angle projections, third angle projections I rotate it with taking a cube, how it looks like, start with your first angle projections. In case of first angle projections what is the difference between third angle and first angle looking at the object. Image will be formed behind the object, in case of first angle, in case of third angle image will be formed before the object, that means object will be back side, image will be formed in case of third angle, but in case of first angle image will be formed behind your object.

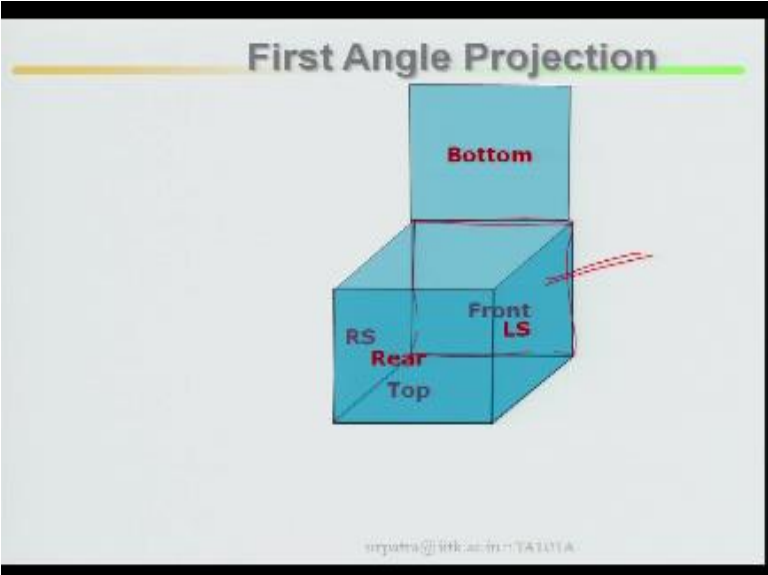
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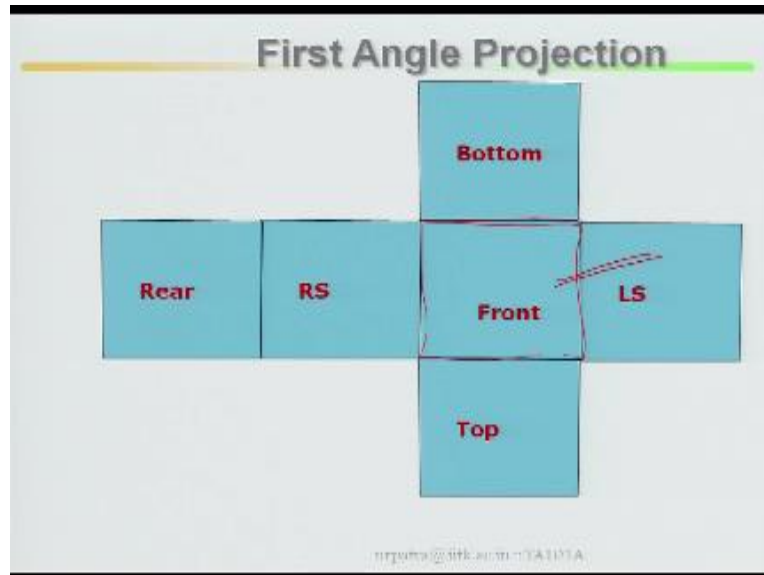
That means if there is object here, object here generally image will be – if I am looking from this side, the image will be formed behind the object. Let us rotate this glass box, first bottom view has been rotated with respect to front view, here look at here, the front view is somewhere else here, front view is here, this is your front view a frontal plane, here it is your frontal plane. With respect to frontal or front view frontal plane I will have to rotate because both these cases third angle as well as first angle projections.

Frontal plane or frontal view is, it is stationary it is not moving. So with respect to front view we are rotating here. So with respect to front view this your hinge line. So it has been rotated back, once it has been rotated back look at your bottom.

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This your bottom view coming, then similarly top view will be coming in case of first angle projection below the front view. So this is your top view, similarly left hand side view is coming in your right hand side and both rear as well as right hand side view is coming, both rear and right hand side view is coming in your left hand side. So once you clear this concept Lateran while drawing it, it will be very easy.

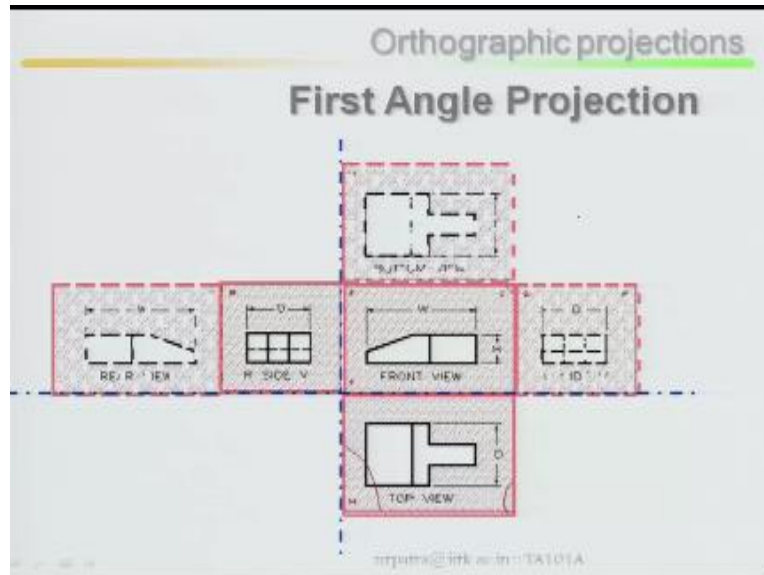
Since basically what is your object line, object is there and how is your picture plane where is your picture is, either it is in front of the object or it is behind the object, and front view or frontal plane is stagnant or stationary you can say that, with respect to front view it has been rotated.

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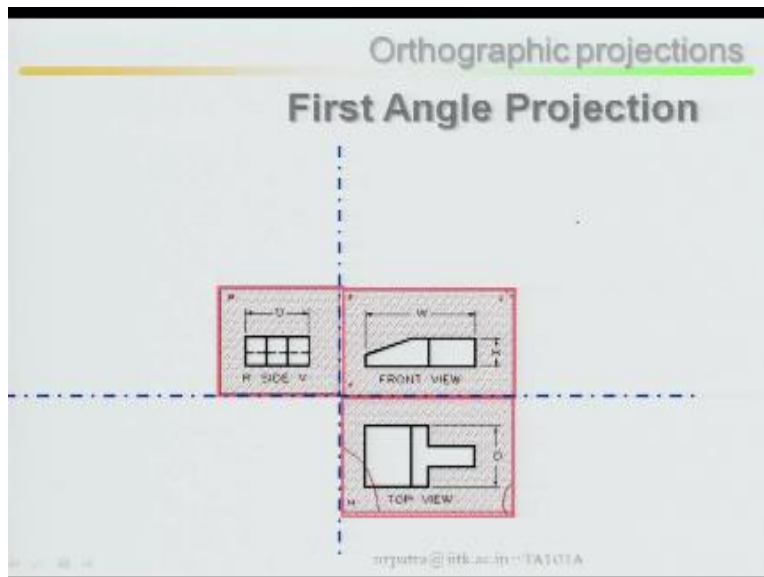
Again do you, again did you notice that all views you are on pole date from front view, yes. You are notice it is on pole date all the views are on pole date from front view.

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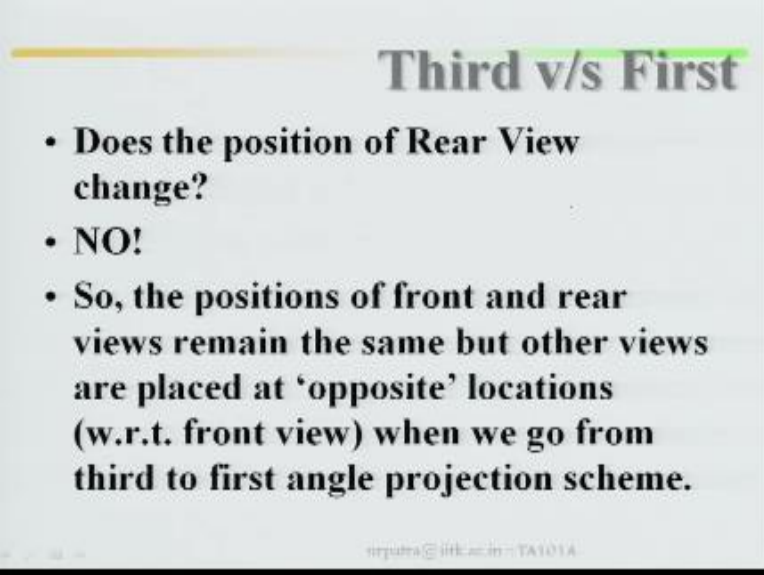
So in case of front view top view in sorry I am sorry in case of first angle projection top view is behind your front view. So here is your front view, then this is your top view, then bottom view is coming at the top of your front view, then left hand side see the difference, left hand side is your right side view, left hand side is your right side view, and right hand side is your left side view. Again this is your rear view. So minimum you need to have to have three views, top, front, and side views yto describe this object. So then mark your hinge line quadrant mark it then remove it.

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So front, top and right side view, for complicated cases you have other three views, you can look at there are other three views and describe any dimensions, how the objects look like, how, what are the dimensions, any kind of any curve features are there, are not, it can be described.

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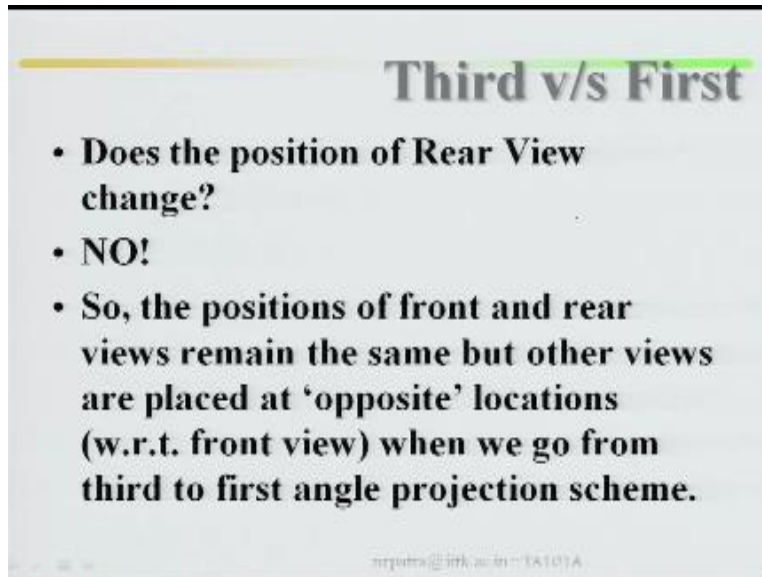
Third v/s First

- **Does the position of Rear View change?**
- **NO!**
- **So, the positions of front and rear views remain the same but other views are placed at 'opposite' locations (w.r.t. front view) when we go from third to first angle projection scheme.**

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Once again does the position of rear view change? In both the cases first angle and third angle answer is no. So the position of front view and rear view remains the same, remember this is a similarity, position of front view and rear view remains same in case whether it is a first angle projection or it is third angle projections, but other views are placed at opposite locations. Why other views are placed at opposite locations? Because left hand side view will be looked at, at right hand side in case of first angle projections. So when you go from third to first angle projections.

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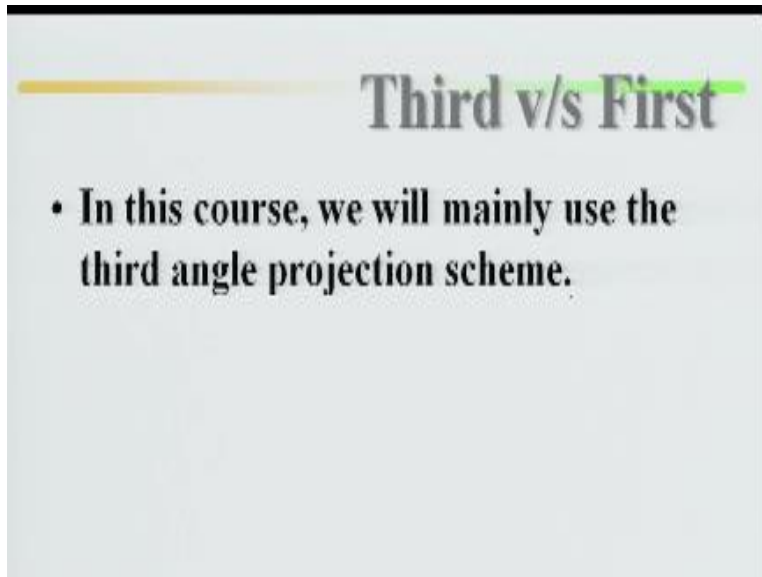
Third v/s First

- Does the position of Rear View change?
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- So, the positions of front and rear views remain the same but other views are placed at 'opposite' locations (w.r.t. front view) when we go from third to first angle projection scheme.

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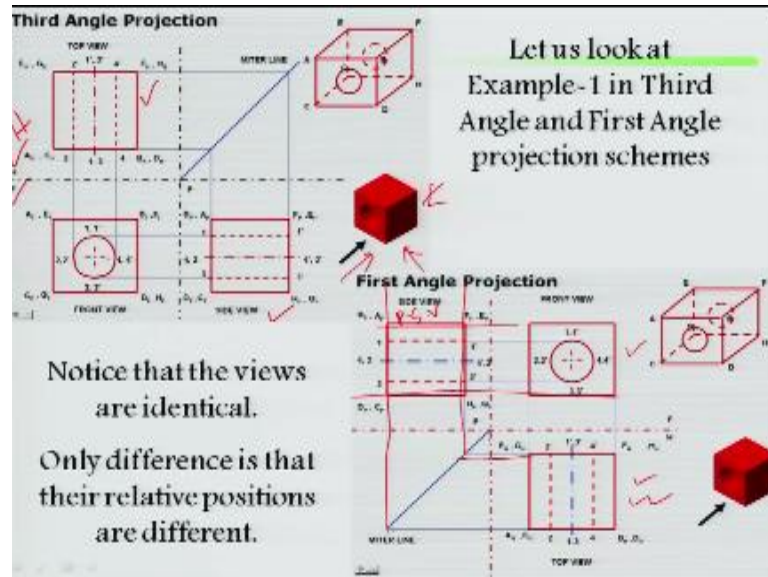
So once again the position of front and rear views remain the same but the other views are placed at opposite locations when you go from third angle to first angle projections, this is a difference.

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Generally engineering graphics are, we generally mainly use the third angle projections, remember now and what if it is not specified in your assignment unless or otherwise it is not specified you assume that whatever the assignment will be provided, assigned to you that will be based on third angle projections, not first angle projection unless or otherwise it is not specified.

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Look at some examples, example one in third angle and first angle projection scheme, this simple object there is a simple object Q and in the Q there is a whole is going, whole is throughout this. So let us start with this third angle projections. So in case of third angle projection where is your hypothec quadrant, hypothec quadrant, these are my hinge lines. So this will be this will be horizontal plane, this will be horizontal plane it has been marked.

This is your frontal plane and this is your third angle projection this will be H- view right side view. So I am looking this object from this side, later on will discuss, this object I can view it from this side, this object I can view it from this side also lateral part is there, which side we should view this object because once you decide this side then that will become your front view. So it is a very simple object.

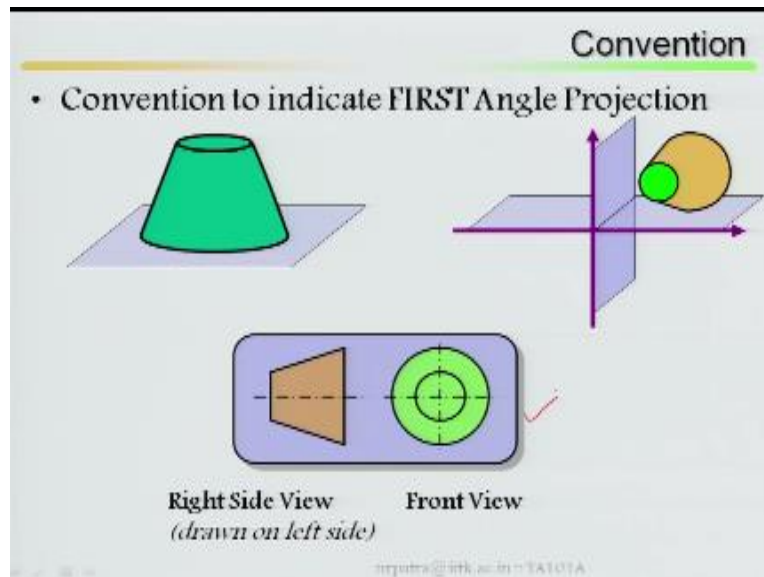
So this is your top view, this is your front view; this is your side view. So once you drop front view and side top view it will be very easy to draw side view because you see look at here, this has been projected and projected back and this has been projected. Basically it is intersection of front as well as top view it is giving this your side views. Now similarly first angle projections, first angle projection will be front view will be at the top as I said.

Here front view will be at the top, then here is your top view. So front view, top view we draw then this side, side view will be which is, this is your left side in case of first angle this will be right side view, this will be right side view, then once you draw this, then project it back look at here it has been projected here, take 45 degree it has been projected here, then here it has been extended like this.

Here it has been extended like this, from here it has been projected. So basically you are getting the dimensions W weight as well as height you are basically getting the dimensions. If you look at this third angle projection and first angle projections these are identical. Again one more difference, the views are identical only difference is that their relative positions where it has been placed.

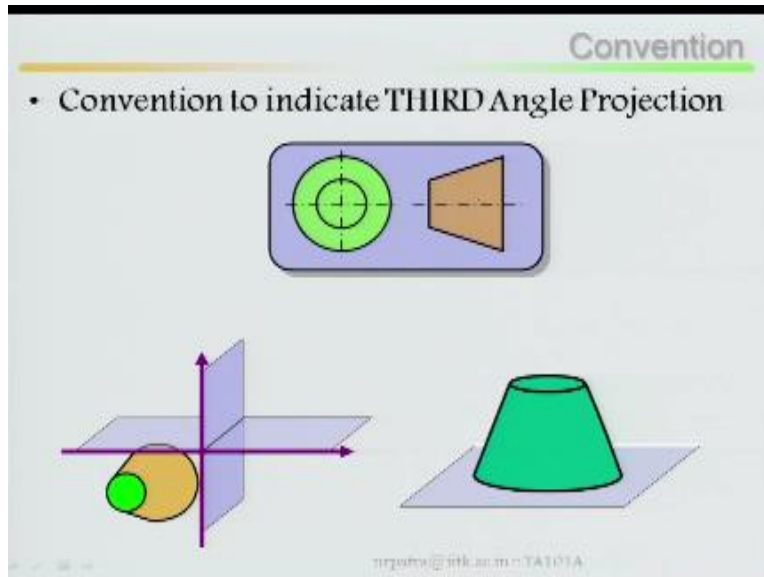
If you look at here top view has been placed at the bottom of your front view in case of your first angle projections, in case of third angle projections top view has been placed above your front view, if I take the top view here it is a top view, here is your top view, where is any difference? Top view is a top view same view point, and front view if you look at your front view it is the same front view. So only difference is that their relative position are different.

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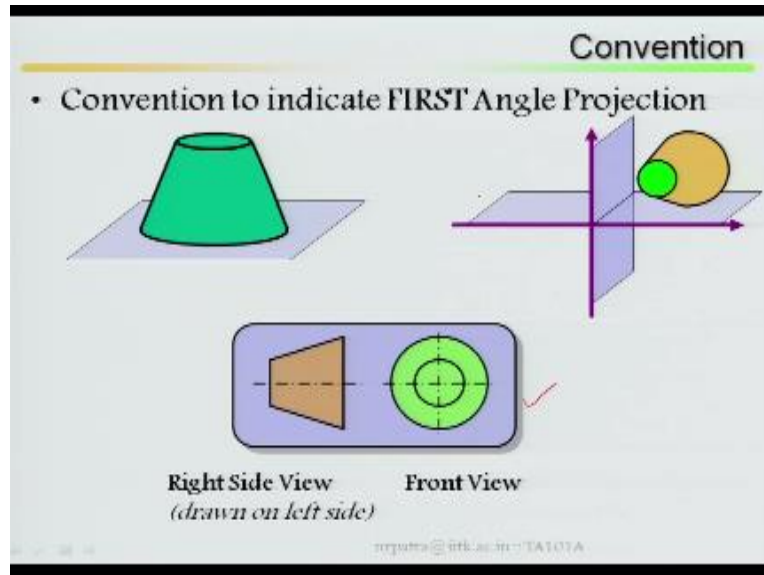
Convention we indicate first angle projection generally convention are there, if you look at here if it is a first angle projections generally it will be put in first quadrant one, first quadrant then how it looks like? Generally this is the conventions symbol, you put it here. So it will be first this way and this side will be circle will be there, once this symbol is there sometimes to make student more attentive sometime. Some of the assignments I may provide this, this way. This indicates this is a first angle projections, this is a first angle projections.

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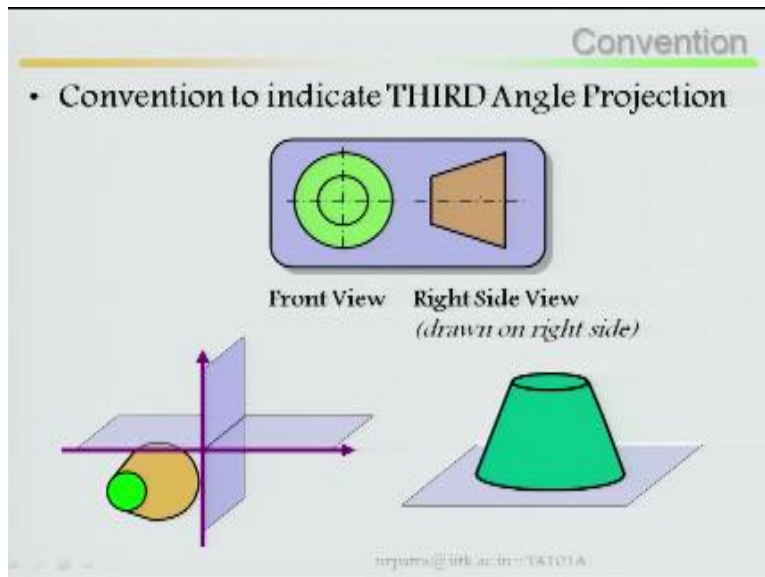
Look at the difference of convention first angle and third angle projections, in third angle projections look at here it comes then here it is coming.

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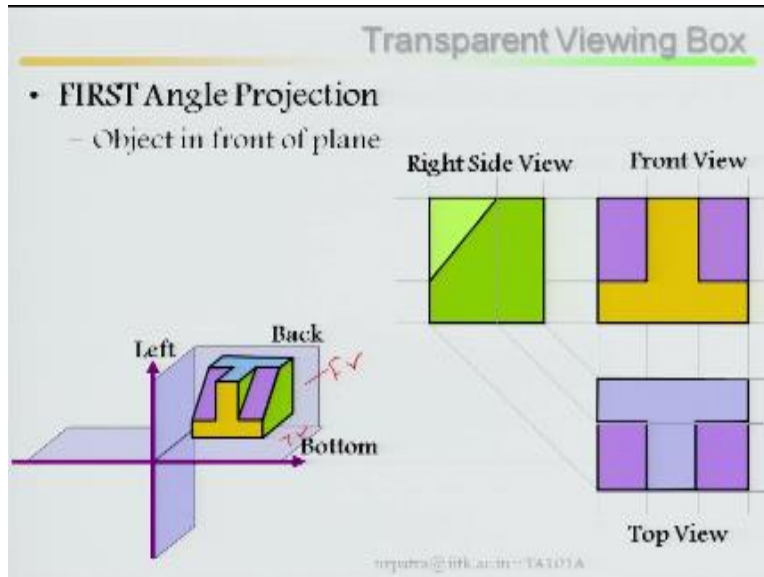
Then in case of third angle projection look this convention changes. It is in the first quadrant

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Third angle projection it is in the third quadrant, right? So how it looks this is your conventions.

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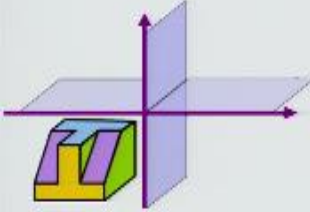
First angle projections object in the front plane, front of the plane, object in the front of the plane, once again object in the front of the plane, object in the front of the plane. So where is your picture? This is your back, this is left, this is the bottom, look at here if I draw it these are all examples I am showing if I draw it if I am looking at the object this will be in first angle projection picture will be picture plane will be behind the object.

Behind the object, that means if I am looking from this side this will be my front view and at the top this will be my top view, this will be my top view. So it is coming your front view then this is your top view, then this is a very simple objects I am complicated object I will go by step by step, next class it will be there this is your side view, again in first angle projection which side view it is? It is your right hand side view in left hand side, right? So top view, front view, right side view.

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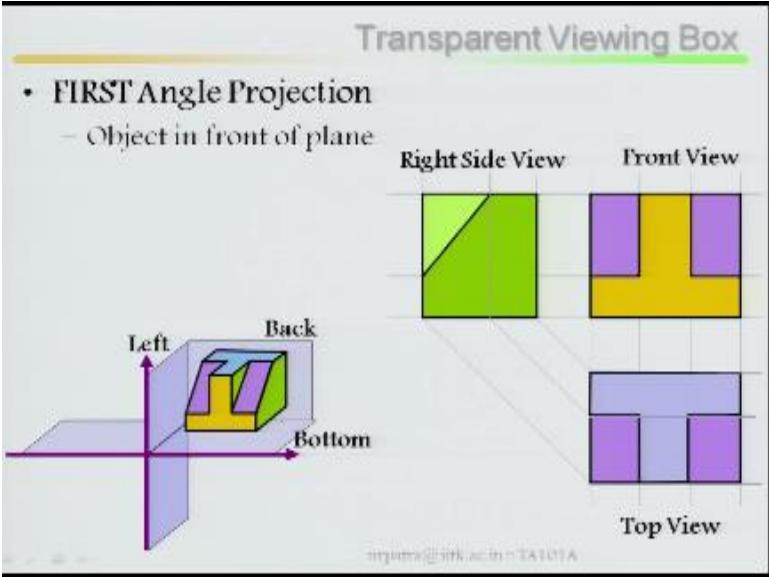
Transparent Viewing Box

- THIRD Angle Projection
 - Object behind plane



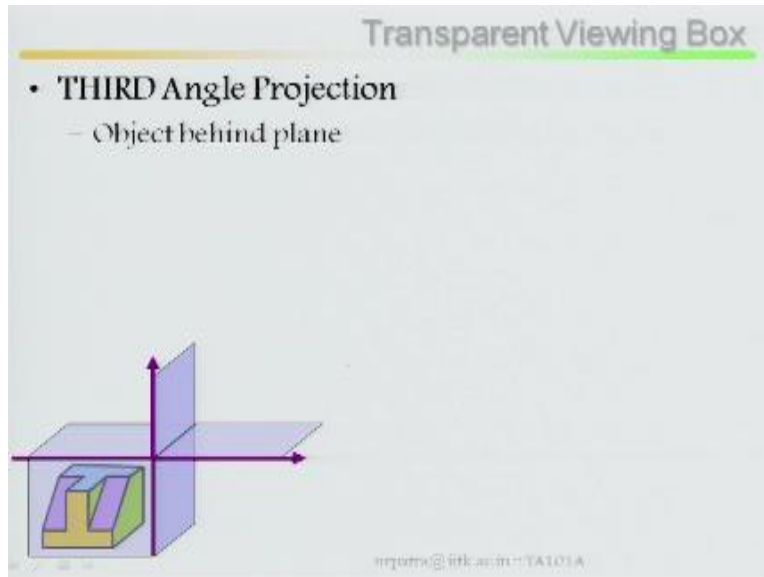
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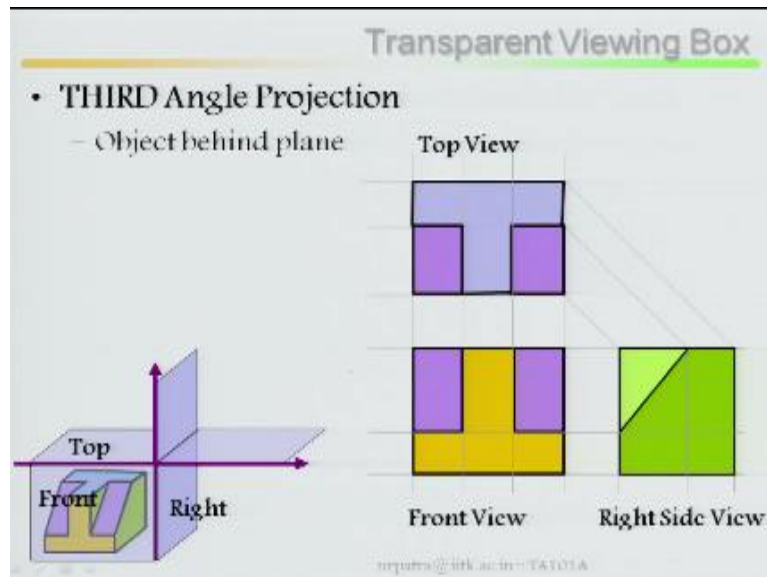
Similarly third angle projections, object behind the plane look at object in front of the plane this is your object, this object is in front of the plane, picture plane in front of the picture plane.

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Look at the third angle projections, object behind the picture plane this is my plane, object is behind the plane. So whatever I have discussed that sort in the drawing I am reflecting earlier part. So then glass works is there. So in case of third angle projections front view is your below your top view. So top view at the top.

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So this is my top view, this is my top view, this is my front view and this will be my right side view, this is top view, this is front view, and this will be my right side view. I think basic features or basic part basic understanding of third angle projection and first angle projection I have covered, more or many more examples I will, I will discuss in the next class, thank you.

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