Engineering Drawing and Computer Graphics
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Module – 03
Lecture – 22
Orthographic Projections I (Part – 2)

Hello all. Welcome to our NPTEL online courses on Engineering Drawing and Computer Graphics. We are in module number 3, lecture number 22.

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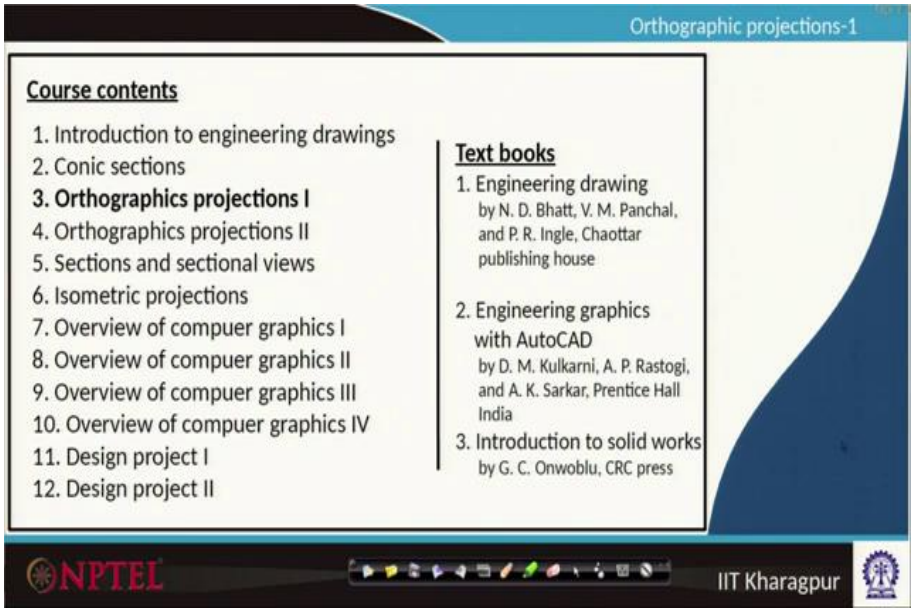

In the first two modules, we have learned about the introduction to engineering drawings and conic sections. From lecture number 21 we are looking at orthographic projections, especially 3 D objects, what is the best way to represent it on the drawing sheet. Such kind of 2-dimensional plots from 3-dimensional, we call as orthographic projections.

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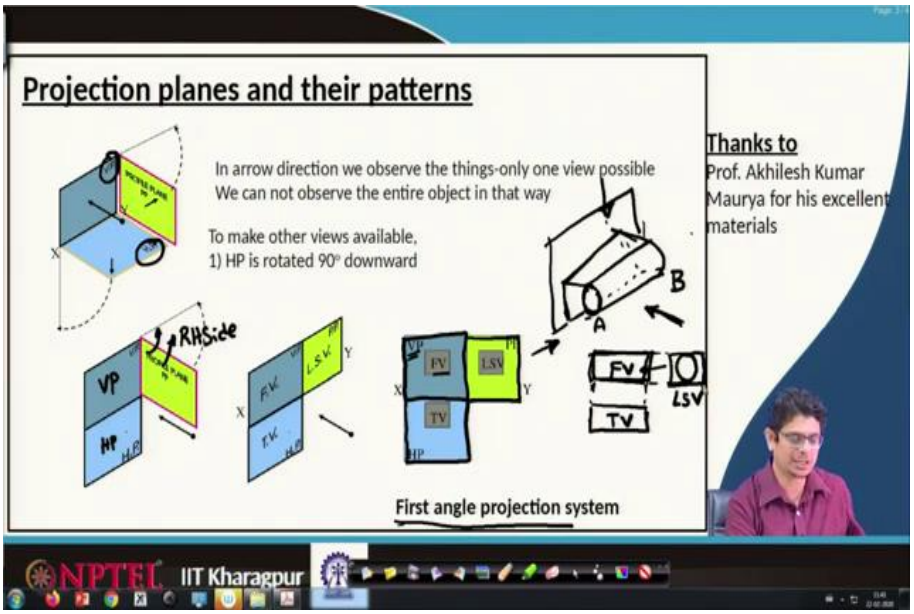

In the last class, we learned about projection planes and their pattern. For example, we define a plane as the horizontal plane which is lying parallel to the table, another one is the vertical plane perpendicular to the plane and a profile plane which is on the side of this X Y-axis. There we learned about first angle projection in which profile plane will be rotated by 90 degrees, so that vertical plane will be at the top level, the horizontal plane will be at the bottom level and profile plane will be on the right-hand side. So, by flipping this profile plane in that direction, we will construct a vertical plane followed by a horizontal plane and a profile plane. Based on the object where we are looking at, first of all, one has to construct a frontal view. Usually, in first angle projection, we construct this front view on the vertical plane. Just below that a top view of the object will be there. For example, if I would like to construct a cylinder; this is the 3-dimensional object and our view follows from this direction. If i is from this direction would like to see the cylinder, the cylinder looks like a circle on that vertical plane. This is the front view like a rectangle we will see.

So, map this entire stuff onto this plane. so that we will get from the bottom also, one line goes in that way. So, this one whatever the projection one we call as front view here. If we are looking from the top of that this cylinder again follows another rectangle. This is what we call top view.

So, on one side let us call this is A B. If we are looking from this direction it looks like a rectangle. If we are looking from the top, again that follows matched up coordinates top view.

If we are looking from this side on the side, we are looking from left direction towards the right direction, then it looks like a circle. This is the circle what we are going to see. So, here we will

see a circle. This kind of representation what we call first angle projection system where the object is placed in the first coordinate.

And we are looking from the left side towards right side so, object or the projection will come on the right-hand side. And we are looking from the left side so, it is called left side view. These are the things what we have learned in the last class.

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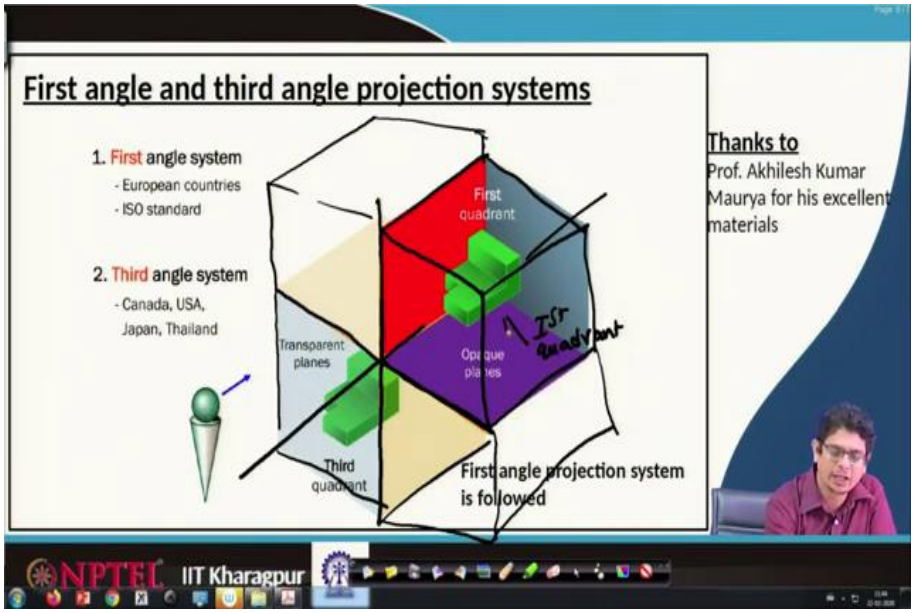

So, in today's class, we will learn more about this first quadrant projections. third quadrant projections.

In general, for any drawing sheets, two methods are popular, one is called the first angle projection system, the second one is the third angle projection system.

The first angle projection system is very popular in European countries and also for ISO standards. In our entire course, for these NPTEL online lectures, we go with the first angle system.

Earlier days it used to be the third angle system quite popular especially in Canada, USA, Japan, Thailand countries; they go with this third angle system. To know more about this first angle projection system or third angle projection system. first of all, draw a 3-dimensional quadrant system.

Let us consider these are the axis which is going to define whether something is in the first quadrant or second quadrant or third quadrant. So, let us construct a box which goes in that way.

So, a box located in the first quadrant. Similarly, construct one more box in the second quadrant and similarly, a 3rd box and a 4th box. For drawing, we mainly look at either third quadrant or first quadrant systems.

So, if the box is placed at the first quadrant system in which if we are assuming another object is placed; something like this slot block. If we are trying to look at what are the views of that box. then that is what we call one of the quadrant systems. In this case, this block is placed in this first quadrant. So, any views constructed based on that we call the first quadrant. Similarly, if the block is kept in the third quadrant and we are making objects observations from that direction, we call that one as the third quadrant system.

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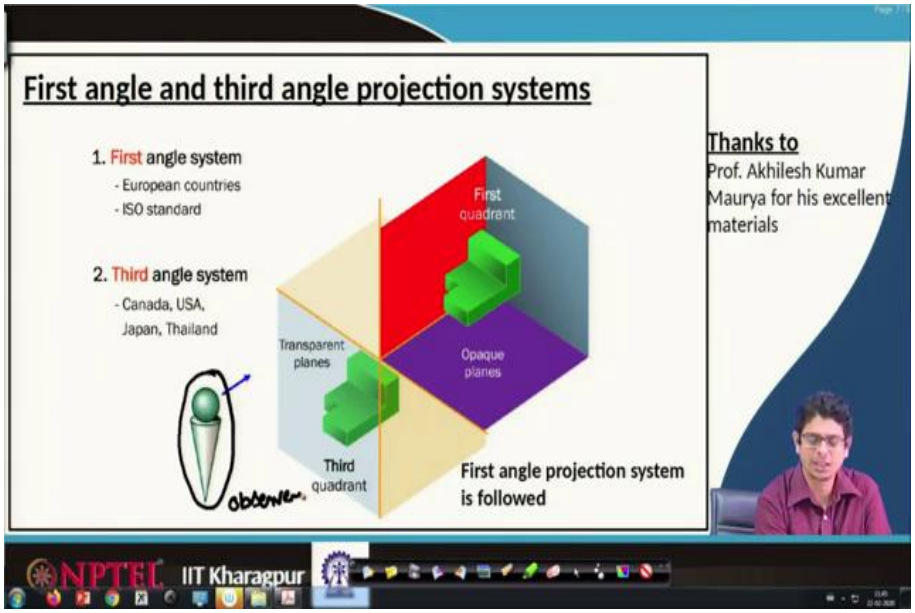

So, based on the observer based on this observer. the views whatever we obtain we call that as either first angle projection or the third angle projection. And these blocks boxes whatever the first quadrant, the second quadrant these are imaginary kind of boxes. These are transparent in one of the planes and opaque on other planes. For example, if we are picking first quadrant system, it consists of in total 6 planes; 4 on the sides top and bottom thing. For the first quadrant system, the bottom plane always is opaque similarly, the backside is also opaque. So, one cannot observe it from backside similarly, one cannot observe it from the bottom side; however, one can observe the object from the front side.Similarly, if someone is observing from the top that is also a transparent plane. So, one might be in a position to observe the following lines and one will be seeing this depth as lines. So, if someone looking from the top. the highly hash portion these are the lines what one will be going to see.

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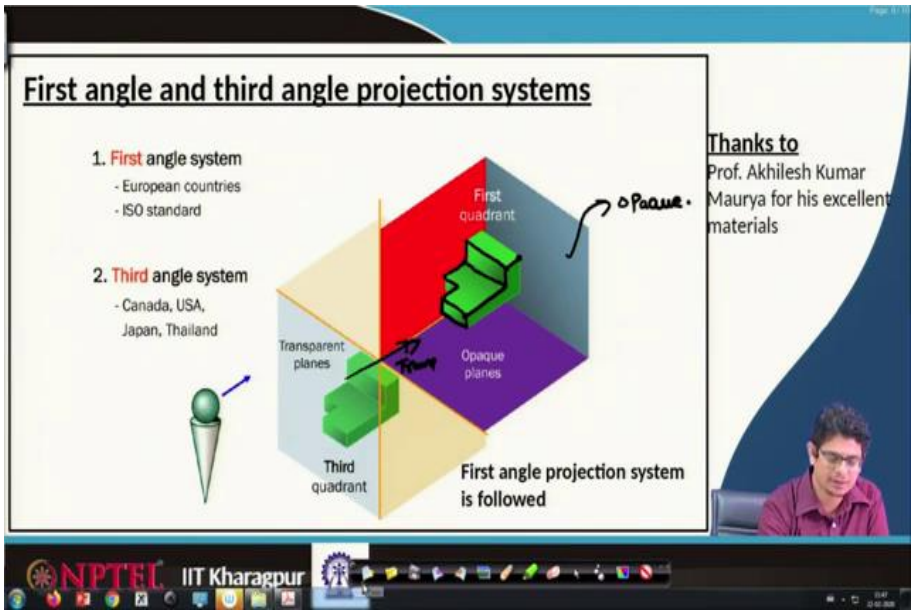

Similarly, if one is looking from this direction, this one always is opaque on the backside, but this one is a transparent wall. So, one can look at from transparent wall. What they will see is the object as these lines.

So, this line entirely coincides with this point and again one will be seeing this ah coincided point; for view, they will see something like this. These lines will be just a line and again coincidental line. Here again, one will see that line. So, these are the lines what one will see in this projection from the side views.

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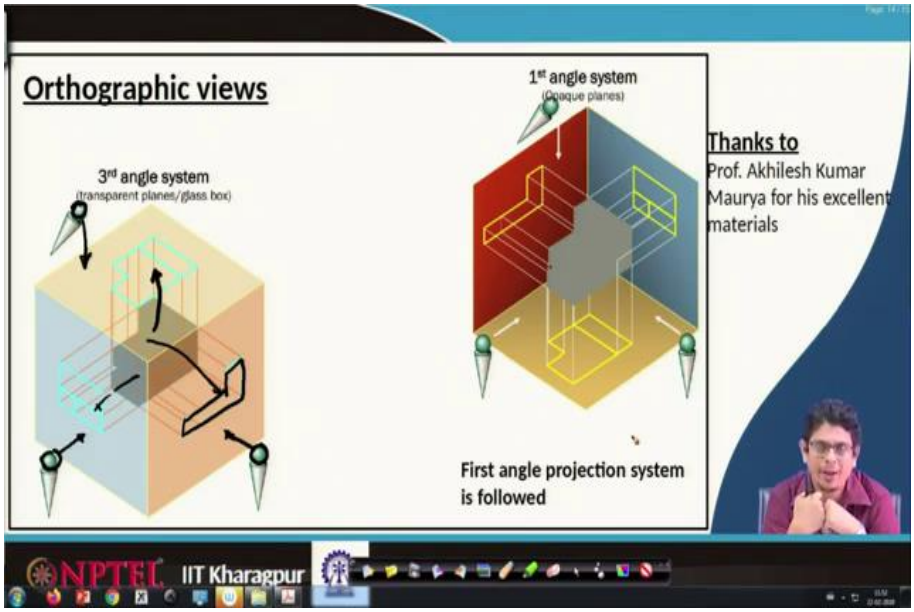

So, here in that orthographic view. So, these projections what we are calling on to the planes onto these opaque planes, what we call generally orthographic views. In the perpendicular direction to that object, we are trying to look at. Observer; whatever he sees by projecting lines is more like if you have a lamp, whatever the shadow it forms and precisely the shadow behind the object the way how it looks like that is what we call this orthographic views.

So, for example, for the same object if the light is passing or through the eye, if we are observing for this, though the object might be slightly having a complicated shape, we will see only like that L shape for the projection. This is what we call front view. If we are looking from the top, the observer is this. So, this line what we see coming from this line. This line comes from this line and this one comes from that line similarly, this line comes from this line this part coincides. So, we do not see anything depth and this one follows that one. Similarly, from the top, if we are looking, that top-line coincides. Here, there is something like a step from the top level to down we are seeing. So, that line coincides with this line. So, we see it like one single line there; this bottom one, this one and this top one. Bottom one coincides and we see this entire line like this one.

Similarly, this line we will see it as that there is going in that direction that goes in that way and it goes up comes there. So, that comes in that way. This is the way we look at these observations; the projections are orthographic views. Similarly, if we are looking from this side where the observer is present naturally, the front one we will see it here.

This one goes like a step comes out. So, that one comes out like that and this entire line coincides to that point. It goes all the way up it goes up and after that, on top, whatever that we see that will be coinciding with these lines and this goes down. So, that one comes in that way.

These are the ways we look at orthographic views in first quadrant system where the side planes are opaque. the bottom plane is also opaque; however, the frontal ones this is transparent direction, this is also transparent direction, this is also transparent direction. Let us look at the third angle projection system. The observer direction is transparent. For example, here we have an observer watching in that direction similarly, the observer is watching in that direction observer watches in that direction onto that direction if we are projecting whatever the thing we are going to see that is what we call third angle projection. Here, the object if we are looking the same object the L shape comes from the projection of that one onto this plane. Similarly, the projection of this plane onto that observer direction we will see this view. Similarly, the object projected onto the plane where the observer is trying to look at again, one more view we will get.

Such kind of things what we call third angle system. So, in this third angle system is more like transparent planes and glass boxes are intermingled with each other.

Here, in the first angle projection size always be our the views on which we are going to project, those will be opaque and the direction through which we are going to see will be transparent. So, because of that easiness usually, we go with the first angle projection system. Anyone can go with any either of them. One can use the first angle and also third angle projections, but these days usually people are going with a standardized protocol like first angle projection. So, throughout our course, we go with the first angle projection. There is nothing like this method is advantageous that method is disadvantaged, it is just one protocol, because of easiness in observing these planes, we are going with a first angle projection system.

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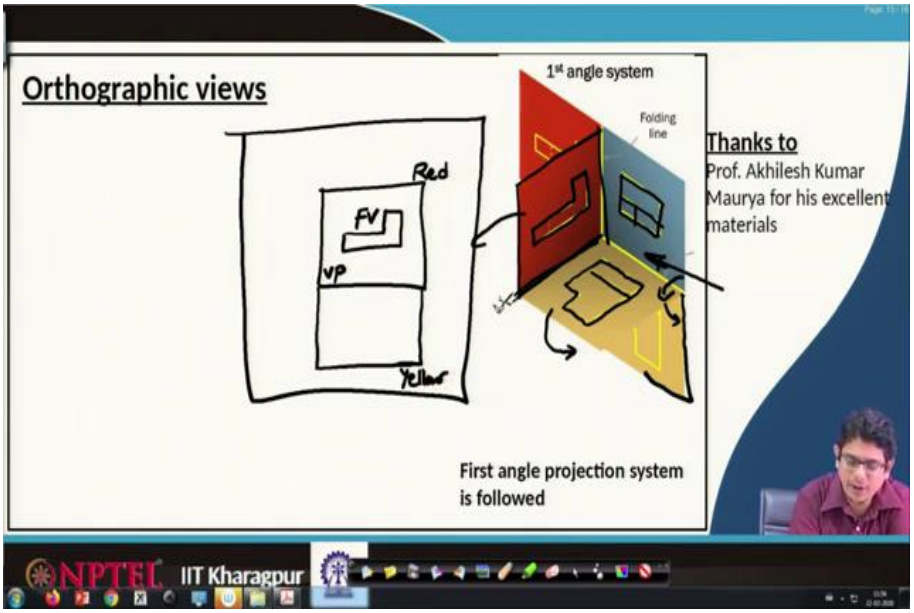

Once these observations are done we have to represent that on the 2 D sheet. Constructing 3 D objects on drawing sheets means we are going to induce aberrations like converging-diverging kind of things. To avoid that, these views give complete details about the object So, we project these objects onto those plane particular opaque planes then, flip the sheets to construct that onto 2 D sheet. Let us look at those orthographics in detail. So, here on the drawing sheet, using the first angle projection system we are going to construct this views. The object somewhere kept at middle and after projections, we got something like orthographic views in that way.

For this one similarly, the side view what we got is this one and the top view what we got is in that way. The standard procedure is first to decide the vertical plane front view. After that go with the top view on that horizontal plane, after that constructive view side view profile plane

view. So, here left side view we will go ahead, construct that and represent that. This is the way we go ahead. So, once these views are obtained on these orthogonal planes, what we do is we represent this one plane; the red plane let us consider. On the drawing sheet if this is the drawing sheet. we first of all show this plane on the object on the vertical plane and this is the front view because the first one what we are observing is in this direction; the front direction of the observer whatever it is present that is what we call front view.

Then we take a cut of that is these are imaginary kind of ah cuts. So, that I can flip this page all the way downward direction. So, the view what we are getting is a top view and what we are trying to construct is, make a scissoring kind of thing here and flip it in the 90 degrees downward direction. So, that we are going to construct a flip plane as that the yellow one or the mustard colour. After flipping making scissors in this direction making scissors in that direction folding it in the 90 degrees.

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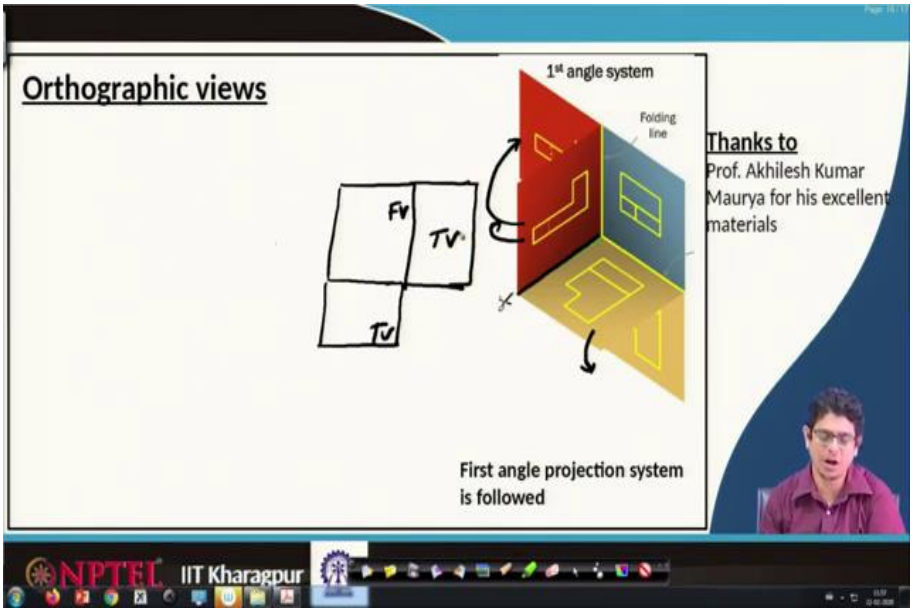

What we will be going to see is something like a red one. If we are folding it in that direction is supposed to come here. flip this one also 90 degrees so that this will come here folding frontal plane this is the front view. this is the top view of what we will see and the rest of that as it is. So, this is the way we generate the views of the object.

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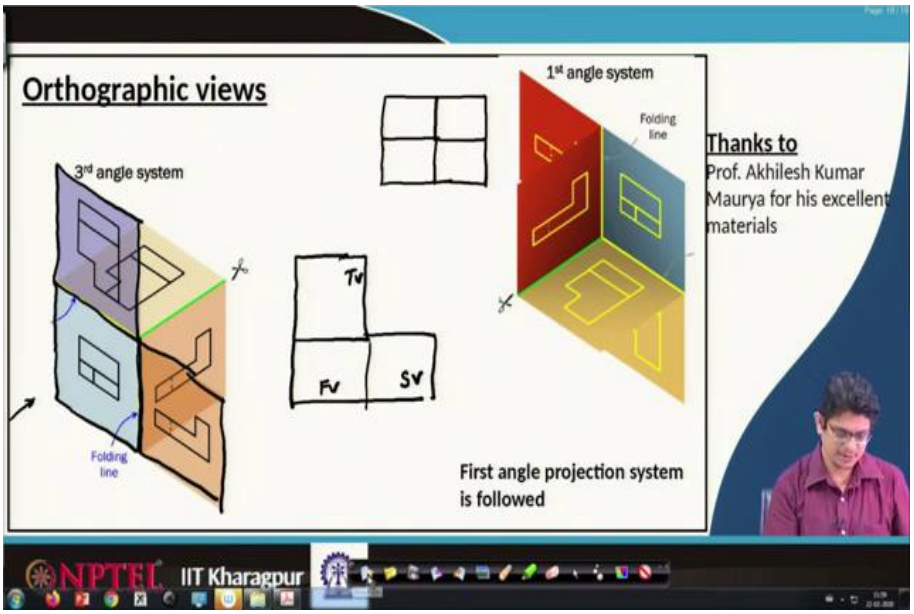

Similarly, if we are making third angle projections. For third angle thing, if we are making a scissor in this line and flip it a folding line around that direction, this entire object comes to this location. Similarly, this entire projection, because we scissored here, I can flip it in that direction fold it. So, if I am making that fold by 90 degrees around this line, then this projection comes to this level. So, let us draw views. One of your views is this, the other view is this. The rest which is fixed, because we are observing in that direction. So, the front view comes at this level.

So, we will see in third angle projection the top view now, placed at this level. the front view placed at this level on the side view whatever we flipped it, it comes in that direction. In the earlier case in the first angle projection system. this is the way we obtain these projections.

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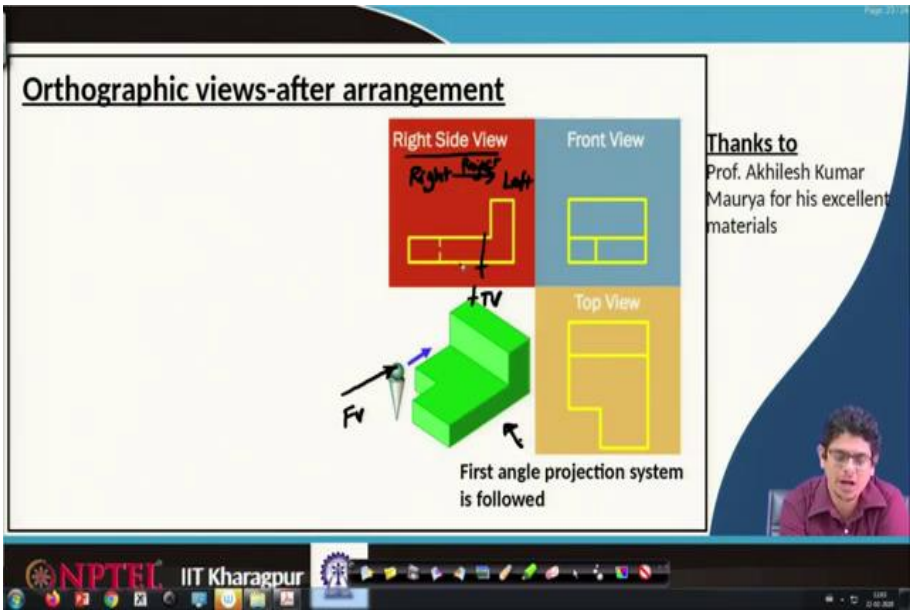

After the rearrangement of these orthographic views on the first angle projection system. we see it an object if we are looking at in this direction let us look at observing the views of this object.

For example, the observer is at this location, the object is that. We would like to view front view if I am deciding this will be my front view. Later we will learn about their rules which one to be picked as front view, which one to be picked as top view and which one to be picked as a side view. Usually, the details which are available many that direction we will pick it as frontal view most of the times.

So, once this is the front view direction is given by arrows usually on drawing sheets if you are observing, there will be an arrow which usually indicates that the front view direction supposed to begin in that direction. So, here let us assume that front view direction is observed in that way. If that is the case what we are going to see is this one. So, this rectangle we will see which goes like a line and this line maps to this line so, maps there. So, what we see is a small rectangle followed by a large rectangle at the front view location. Similarly, on top of that, we are going to see this object. After constructing the front view, we have to see it from the top view. Now, the direction for the front view is this direction. So, normal to that direction if we are observing this, what we are going to see is this part and this part. So, this one coincides with this one, this one coincides with that one. So, what we are going to see is this one. So, first, we see that the direction is in that way. So, what we have to look at is on to that plane if we are looking at a projection, whatever it is happening that we are going to see it. That after folding it into that direction we see it in this way for the top view. Now, side view. because this is a front view, this

is a top view. One can look from the back also. but in first quadrant system that is an opaque plane and the transparent plane is in this direction. So, if we are looking at that, the side view of this entire object maps here. Because now, this is the direction for front view direction, this is the top view direction. From the right side, we are trying to project it on to the left side. So, that view what we are calling right side view. So, right is projected to left.

So, right side thing we are projecting on to the left side. So, naturally on the left plane will be opaque and we are going to get that view. So, what we are going to see is projection one this one. This entire plane these points everything mapped under this one, because there is a line which is going as a cut all the way down for this. So, usually, we represent by the dashed line in the picture instead of saying that this is a complete block. If it is a complete block, there is no line behind that. To just indicate that we represent that cut by a dashed line. If you are looking from the front view, there is a visible line it is a cut, but still visible that is a reason we show it by a continuous line. However, in the side view what we are saying is there is a cut, but we cannot view it if we are projecting it. So, we just to represent that intricate dimensions or directions also we are showing it by a dashed line.

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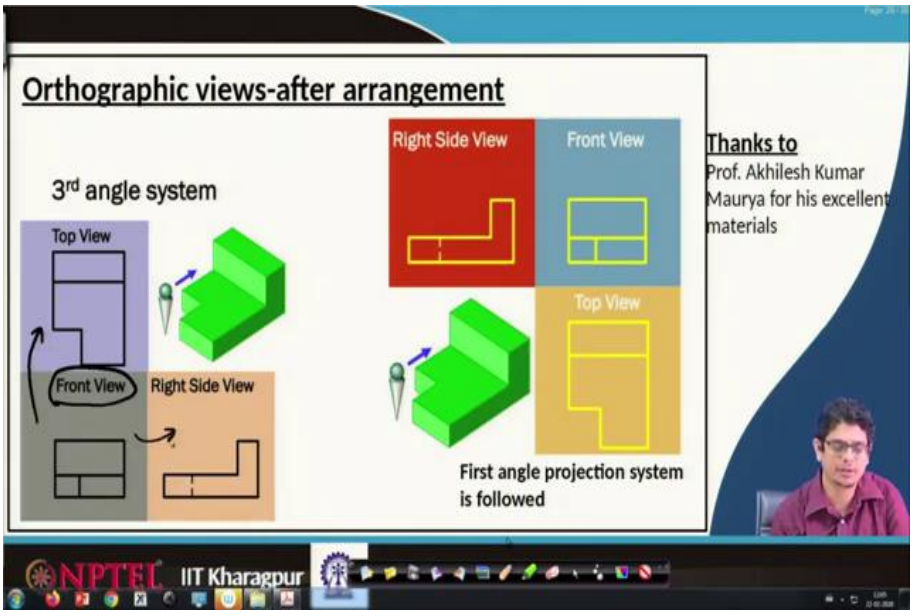

In the third angle system, these views will be alternatively arranged. So, the first front view whatever it is present. that comes at the bottom level. In the first angle projection system, it is recommended to have a front view at the top; top view below that and right-side view connected on this front view. So, the front view is the central one. That will be connected by the top and right-side views or perhaps left side views. Whereas, in third angle system third angle projection

system, what we see is for the same object the front view comes at the bottom level. the top view goes to the top level and right-side view comes to the right-hand side.

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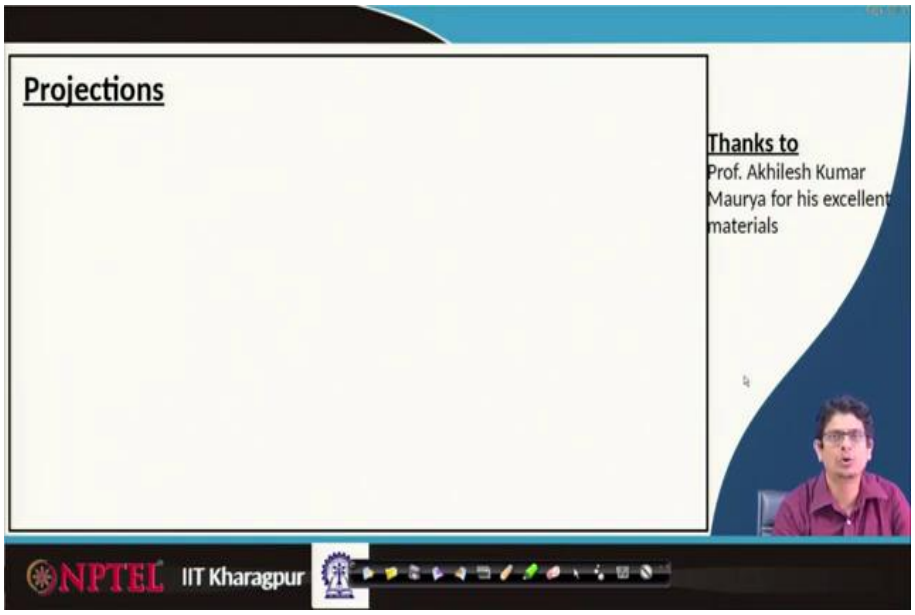

In the next class, we will learn more about projections of the system.