Engineering Drawing and Computer Graphics
Prof. Rajaram Lakkaraju
Department of Mechanical Engineering
Indian Institute of Technology, Kharagpur

Module - 05
Lecture – 46 and 47
Sections and Sectional Views (Contd.)

Hello everyone. Welcome to our NPTEL online certification courses on Engineering Drawing and Computer Graphics. In the earlier classes, we have learned about Sections, in this class, we will learn more about Sectional Views.

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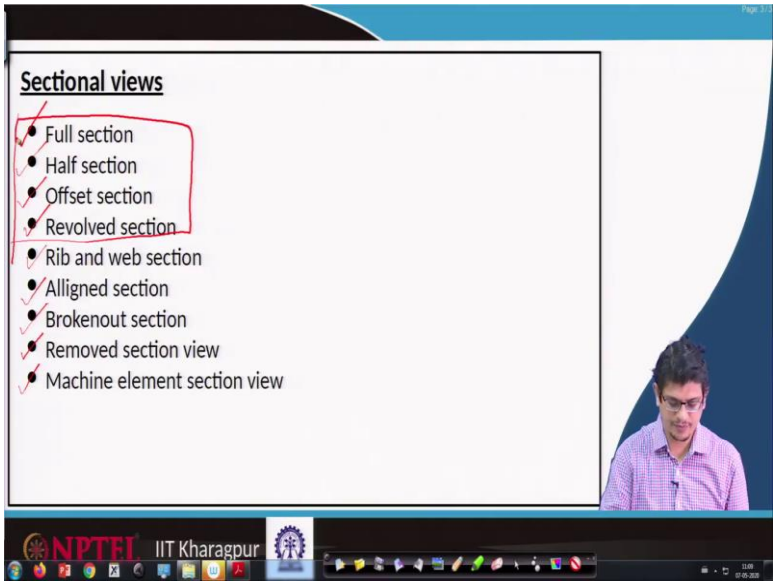

So, in these sectional views, we have different topics namely: how to draw full sections, if it is a half sectional view of how it looks like. How to draw offset sections, how to represent revolve sections. These are the things what we will learn in today's class.

In the next classes we will learn more about rib web sections, aligned sections; if it is a broken out kind of section how it looks like. And, if any part is removed how to represent that and a typical machine element; if we would like to represent it as cut sectional view. These are the topics what we will cover in sectional views. So, let us first begin the first part on full section and half sectional views.

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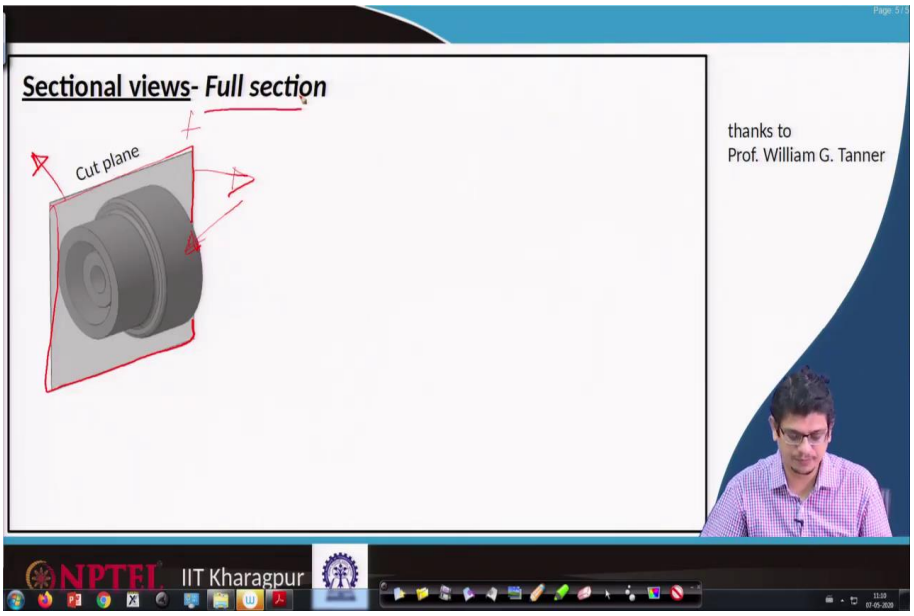

The first topic what we cover is a full section representation. For example, let us consider this kind of object, perhaps a part of the camera lens. On that, we will like to slice it precisely at a midplane passing through this camera object and we will like to retain the portion which is on the left side and remove the portion which is on the right side.

So, we split this into two equal parts through this cut sectional plane, keep the left part, try to visualize how it looks like and remove the right side part. This we do it to know interior details of that camera object, from outside at isometric view we will see the periphery of the surface, what are the dimensions and so on. What kind of elements are present inside of that, unless we take this imaginary cut plane; we cannot see those details. For that purpose, we look at this sectional views. And, here the entire object we are slicing it into two equal parts and remove it. There is a reason we call such kind of objects as full sectional views.

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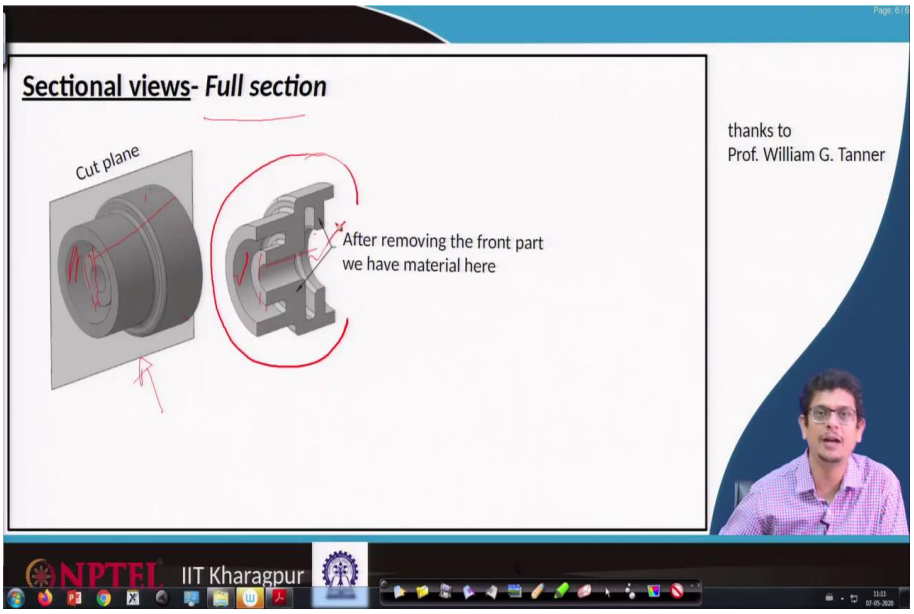

So, after removing the right side part, the leftover part is this one. Here we can see the interior details like this one as that. And, once this slice is passing through that we see material here, that is this. And, because we are taking a slice in that direction, we have that shape. And, similarly, at the background, there might be a shape which is passing through that which is not directly visible from this isometric view. But, when we have this full sectional view, we can see what is there at background also. It is a three-dimensional object made with the material. So, when you are slicing it, you always be having some material within those portions; wherever the plane is passing through that we will show it by hatched lines.

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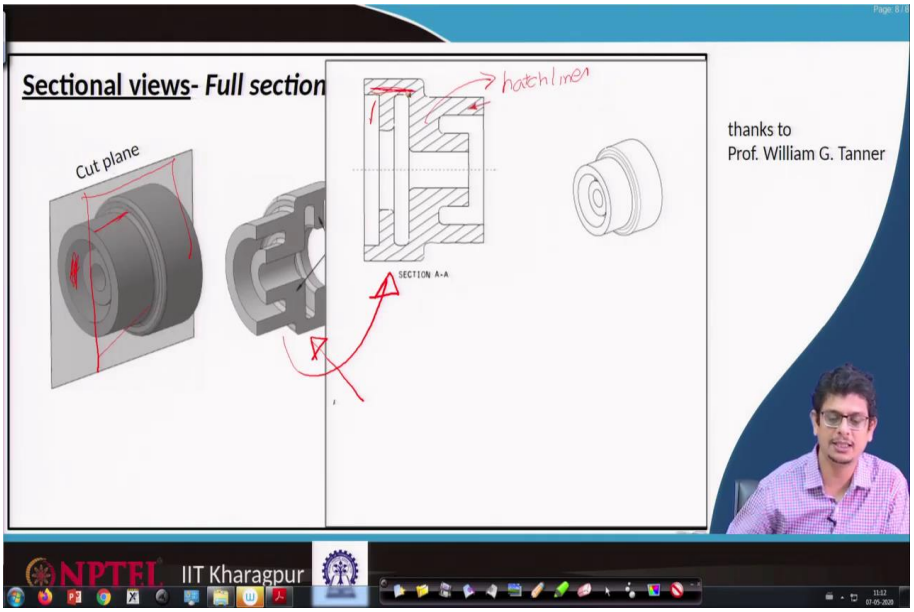

So, this object if we would like to represent as a planar view; that means, we would like to visualize it from that direction how it looks like. Now, the plane whatever it cuts that part only we will show it by the cut sectional view. If that part is not cut by the plane, we will not show it by hatched lines. These are the hatched lines. So, this part when slice we are going to make it, that part is not chopped off by this plane.

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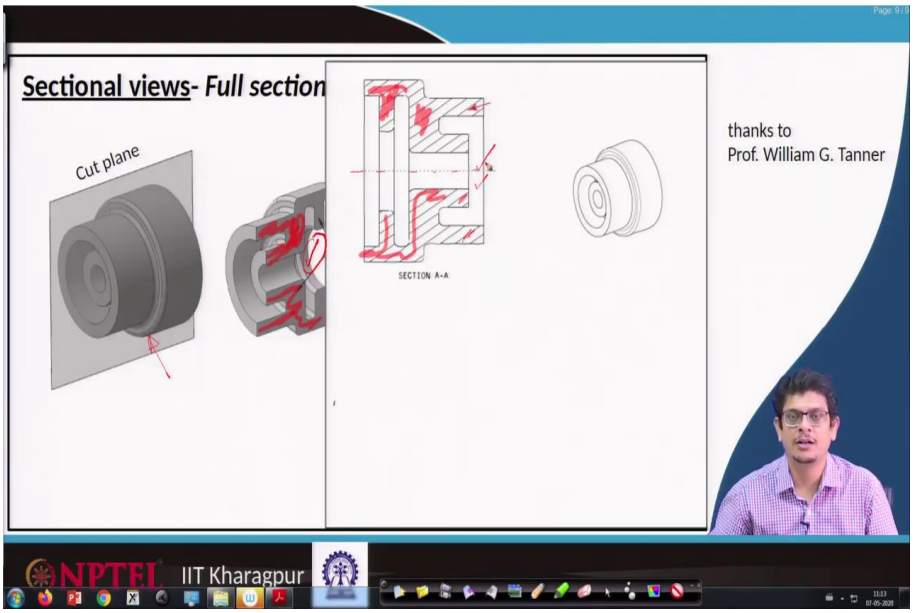

So, this part we should not show it by any hatch that part is that and this material is slice; so, that material is that. Let us use some other colour. So, this part whatever we are seeing, these are the things. Similarly, at the bottom also we have that kind of material. So, we have such kind of material and this part; similarly, this part is not sliced by the plane.

So, this part is not sliced by the plane. So, we do not show it by any hatch; wherever material has been removed that part we will show it by hatched lines. If this during the slicing, if we are not in a position to remove that material then we do not show it by hatched lines; because this is an asymmetric object we always show it by centre line information.

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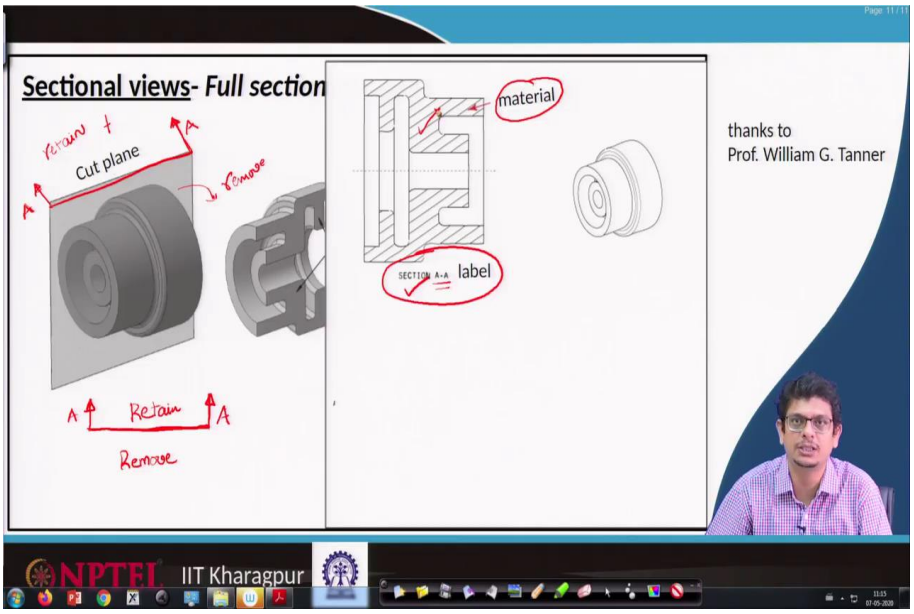

The second most thing is we always represent whatever the section we have employed with below section A A label we will show it. So, I can have a slice, let us use arrows A A. So, the arrow direction represents we are going to retain this part and we are going to remove this part. So, the direction of the arrow represents the retaining portion. And, when I am looking from top view it looks like there is a cut plane like a line, there will be arrow direction in this way.

So, usually, we represent which section we are representing for this cut sectional view. So, that label has to be mentioned and whenever you remove the material, you have to represent by suitable lines. If it is iron kind of material one kind of lines we use; if it is brass, bronze, copper different kind of things we will use; if it is wood different kind of lines.

So, based on those line representation we will be in a position to understand what type of material we are using. Typically, when you are in production lines in industries during this manufacturing process drawing sheets will be distributed. And, there we will be in a position to understand what kind of part we are manufacturing and what kind of material has been used internally.

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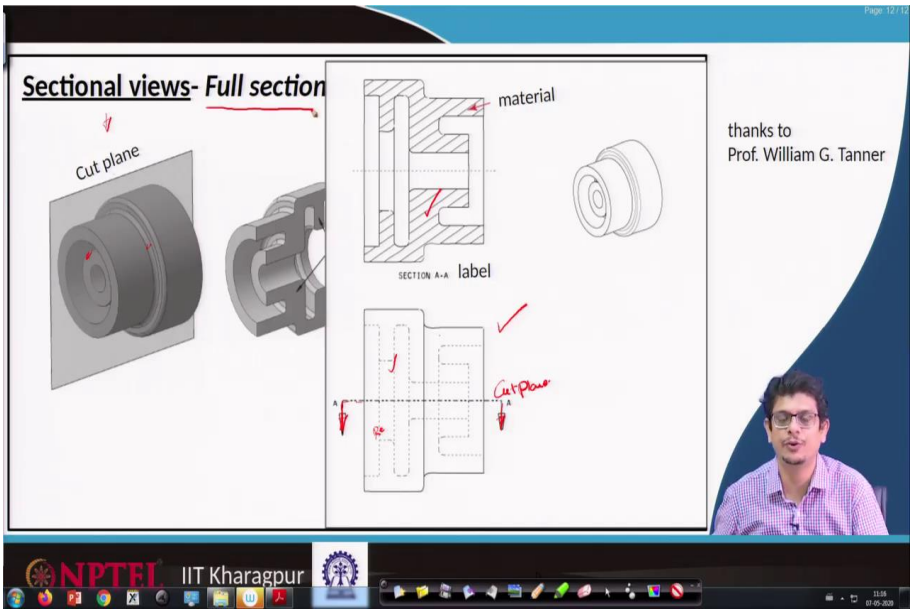

To represent pictorially, the schematic usually we show the complete object in the top view and there is a section plane. So, if we are looking from a top few things, the way how it looks like is the part whatever we are going to retain show it by arrows. And, the cut plane long dash followed by two small dashes and so on; that is a cut plane representation.

And, internally we have these hidden lines which are these lines, that we will show it by dashed lines. For that, we retain this portion, remove that portion whatever the leftover section that is a way we represent. If we do that with the entire object, then we call the full sectional view.

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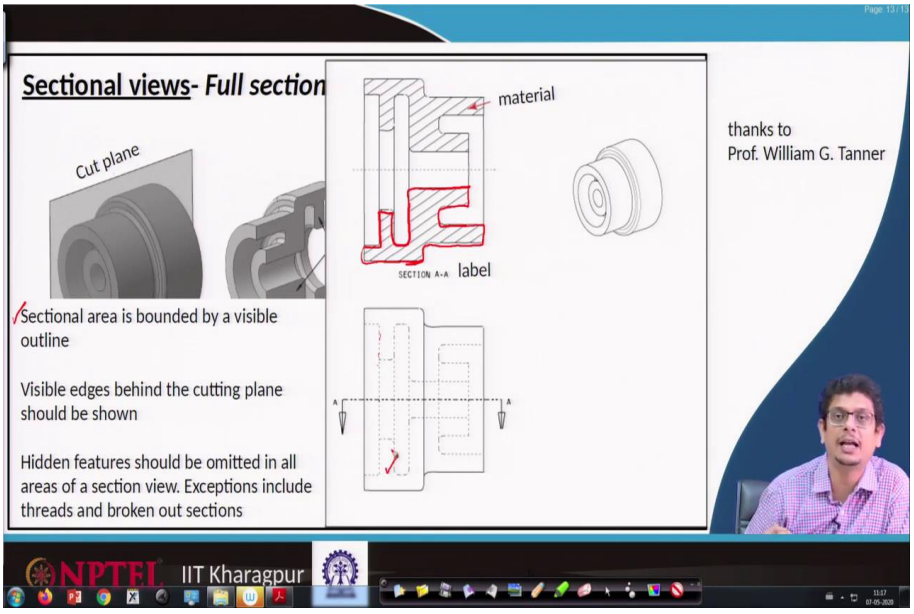

There are important points. The sectional area is bounded by a visible outline. When you are seeing that though at the top view and other things when we did open the cut section, we represent by dashed lines, after cut it should not be a dashed line because the plane is passing through that. So, this line supposed to be a continuous line. We should not represent that by dashed lines. This entire thing supposed to be a continuous one whereas, in top view without removing that cut section; these are dashed lines. The second point is visible edges behind the cutting plane should be shown. So, whatever the visible edges we can see those supposed to be clearly shown on that cutting plane. If there are any hidden features, that should be omitted in all areas of the sectional view.

For example, we are making a slice here, but there might be internal parts which are hidden; somewhere here behind the section, there might be internal parts. But, when we are representing cut sectional view, we should not show that hidden part on this cut sectional thing; though it is a backside of that object as hidden, that should not be represented. There are exceptional exceptions.

For example, if there are threads and broken out sections which we will learn in the next class, during that broken out sections we can show that dashed kind of lines. But, most of the cases if there is a hidden thing that we should not show after taking cut section. This is the standard representation.

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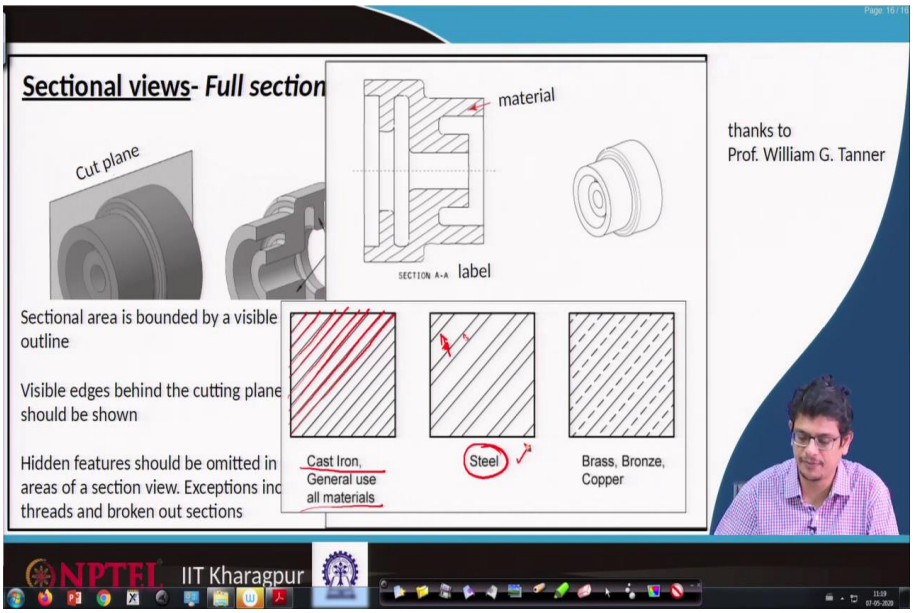

Now, regarding the type of lines, we should show, that based on the materials. So, we will be having a data book where we can see if it is an iron material. For example, if it is a cast iron or general use of all materials we show it by incline 45 degrees lines as a hatch and these are the parallel lines we have to represent.

So, using your mini drafter you can draw these parallel lines. If it is a steel, these are not just parallel lines, but two parallel lines together we have to show with a gap. So, such kind of representation represents steel. If it is something like brass, bronze or copper material, this kind of soft materials; we show it by a hatched line followed by a dashed line, again followed by a continuous line. This is the way we represent materials.

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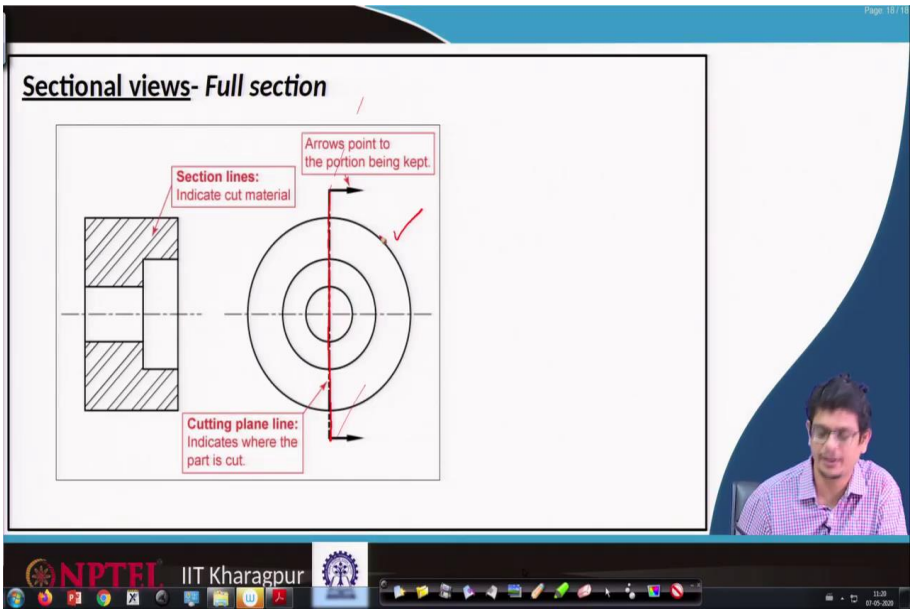

Let us look at more details about the symmetric object. So, here we have such kind of circular symmetry, azimuthally symmetric object. And, we would like to slice this along that plane; that means, normal to the computer you are going to take a slice of that object.

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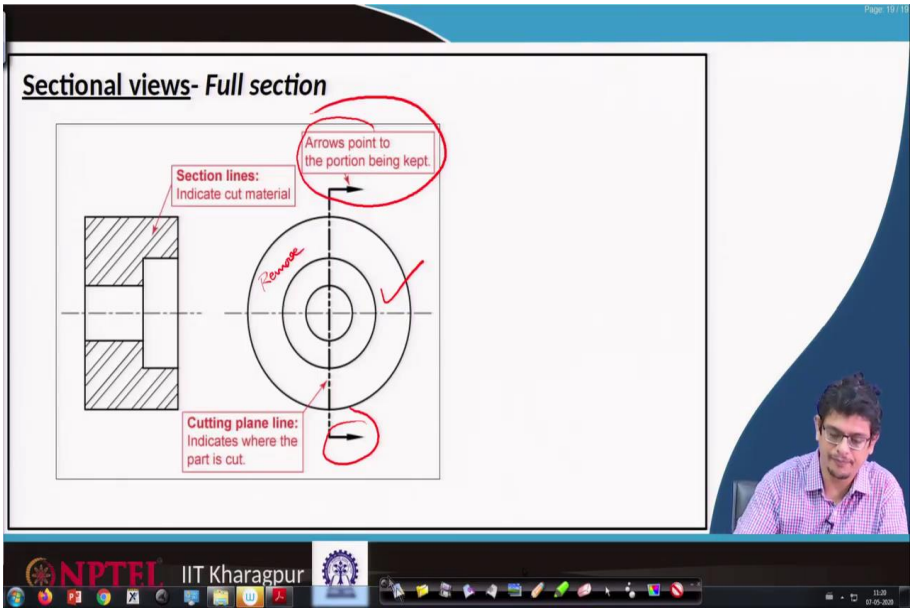

So, if I am going to represent this plane goes all the way in that way and retain the arrow direction part; that means, retain this part, remove this part.

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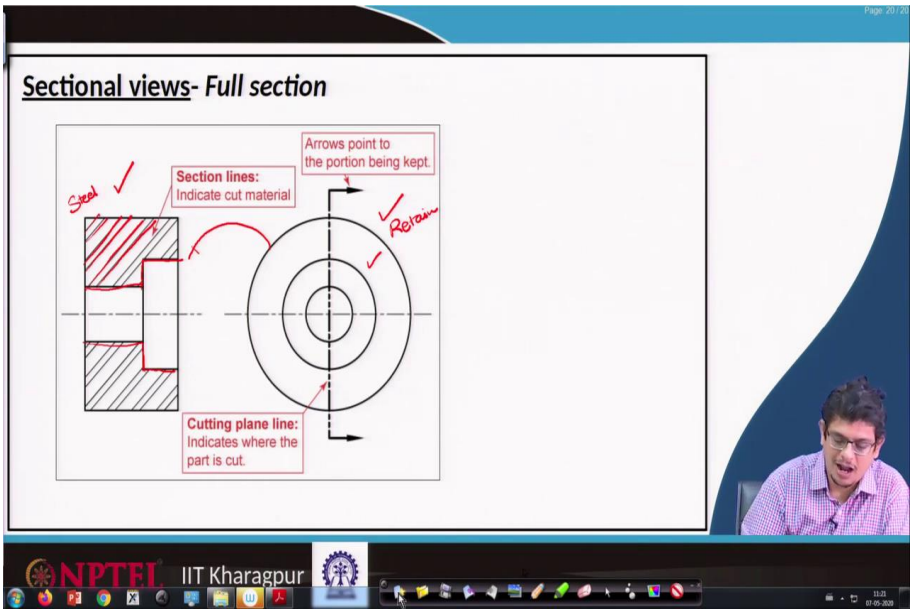

Once we are done this part whatever we are going to retain that we are showing it here. You can see the internal structure of this object, it is having a bore, drilled bore, having that portion. And the material is filled in this way because two parallel lines separated by this. So, it is a steel object.

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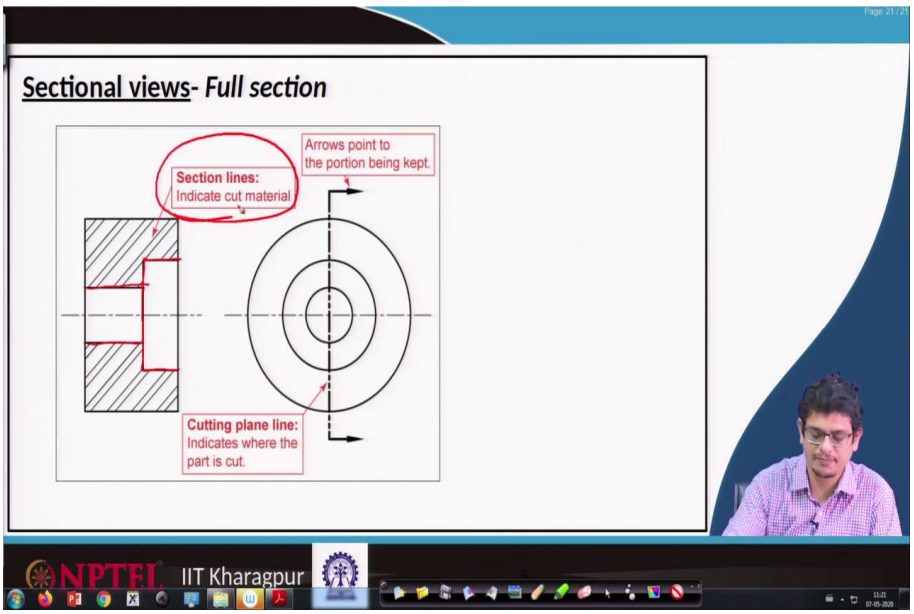

Let us take one more example, here we have an object and cut plane section let us call A A; retain this portion, remove this part.

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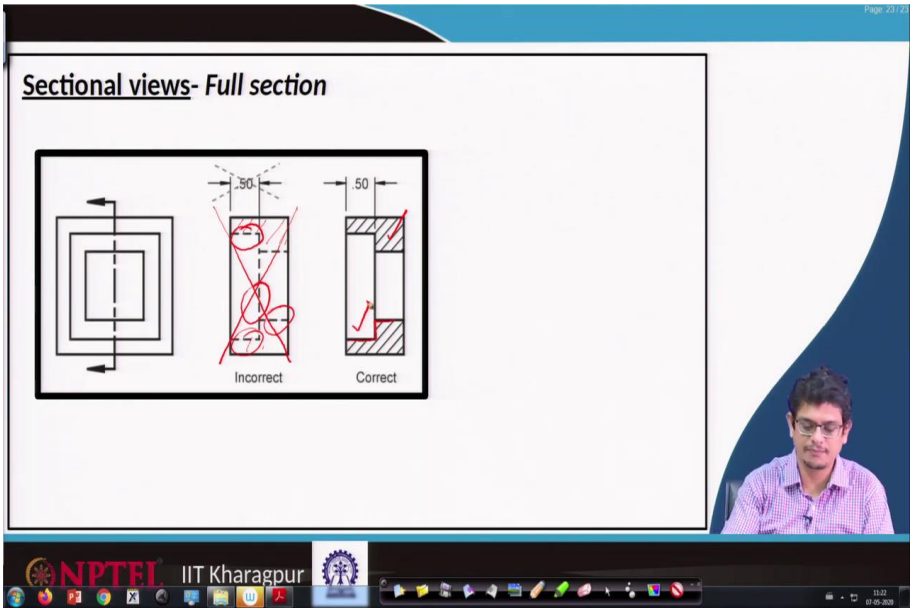

If I want to represent that material, after showing that sectional view I should not just show it by this kind of hidden lines. This is wrong. Second thing, when you remove the material through cut plane is supposed to have hatched lines. Those hatched lines are also missing. So, this is a wrong representation. The right representation is having those things and also having these continuous lines.

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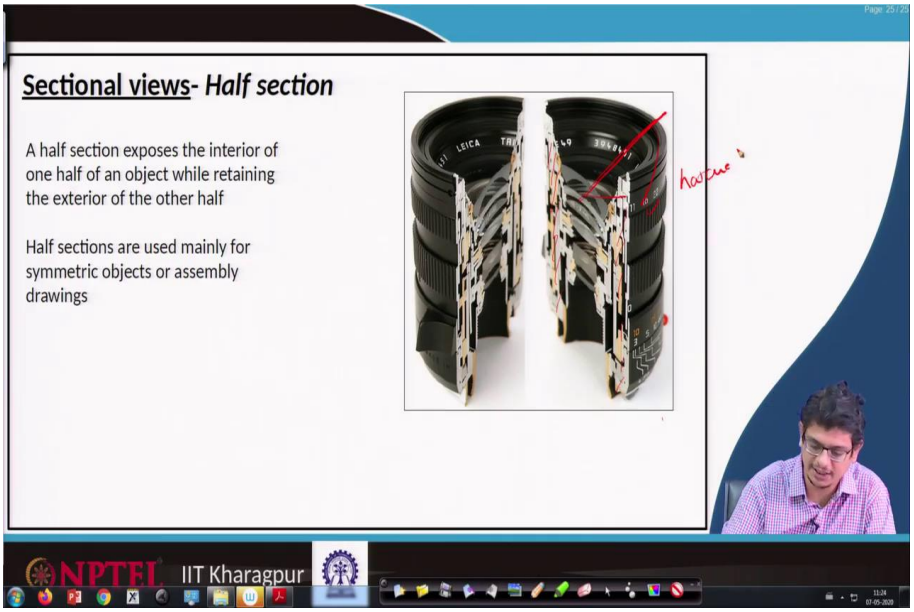

Now, we will look at half sectional views. So, a half-section exposes the interior of one half of an object while retaining the exterior of the other half. And, these half sections are used mainly for symmetric objects. The full sectional view you do not require this symmetry. But, representing half sectional views are advantageous because we do not have to fill the entire object by this hatched lines.

Because, they have a rotationally symmetric thing, some one-quarter of that portion we will remove it and show the remaining part by half sections. Let us look at that. For example, we have this object; this is a circular symmetric. Now, if I want to represent, I do not have to just hatch all this part and all this part is a camera lens.

In fact, for the same camera, I can only represent this one-fourth quarter of that as hatched lines. Thus, also serves the purpose; such kind of things if we are going to do, we call that as half-section things.

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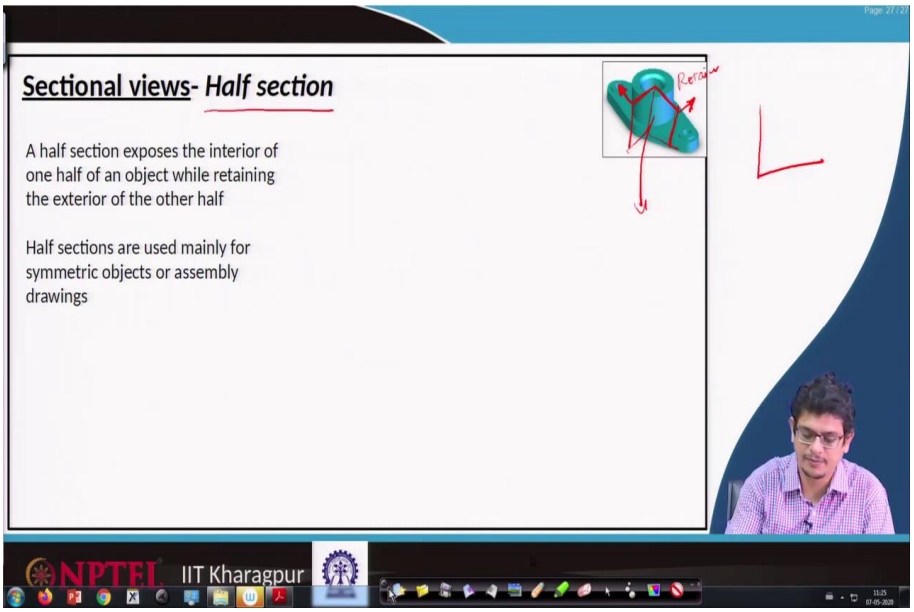

For example, let us pick another object. So, we have symmetry in this direction for this object. So, now I can remove this part and remove this part and retain this part, try to visualize how it looks like.

So, if this is the cut plane thing, retain this part. This is the cut plane; retain that part. So, my plane goes in that way; like an L angle, L angle plane I would like to make a slice and remove this part, retain this how it looks like. For that kind of purpose, we use half-section.

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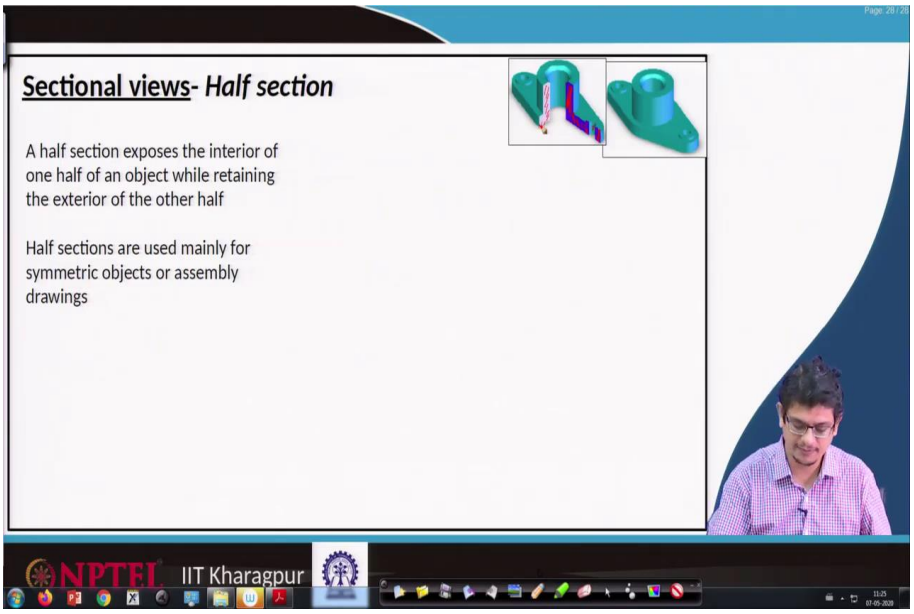

So, if I remove that part visually, you have material which is visible here. We did not remove this part; so, we do not show it by hatch and again this part is removed. So, we show it by hatched lines. Similarly this part we have removed it; so, we show it by hatched lines.

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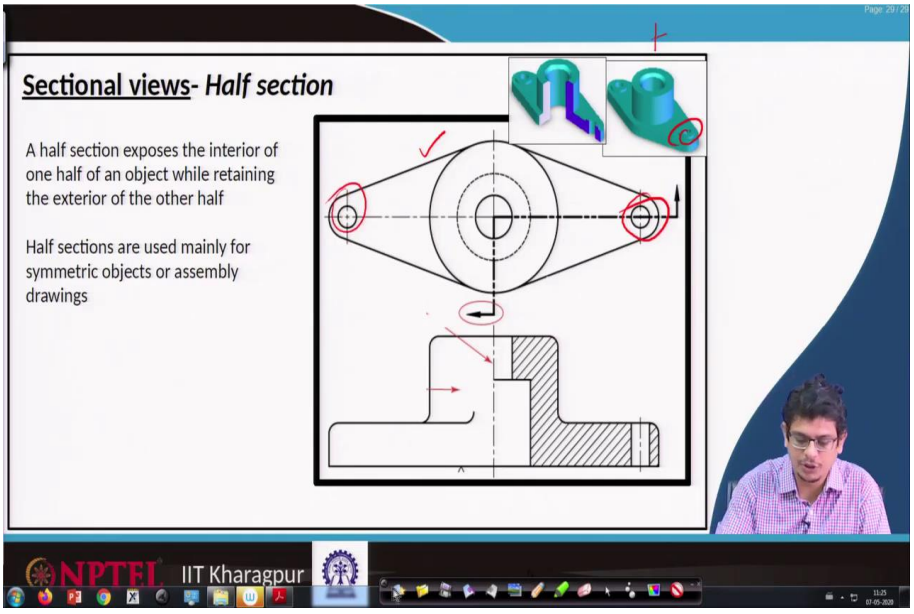

So, if we are looking from the top view, this is the object how it looks like; these circular holes and so on. And, the portion what we have to remove is retained.

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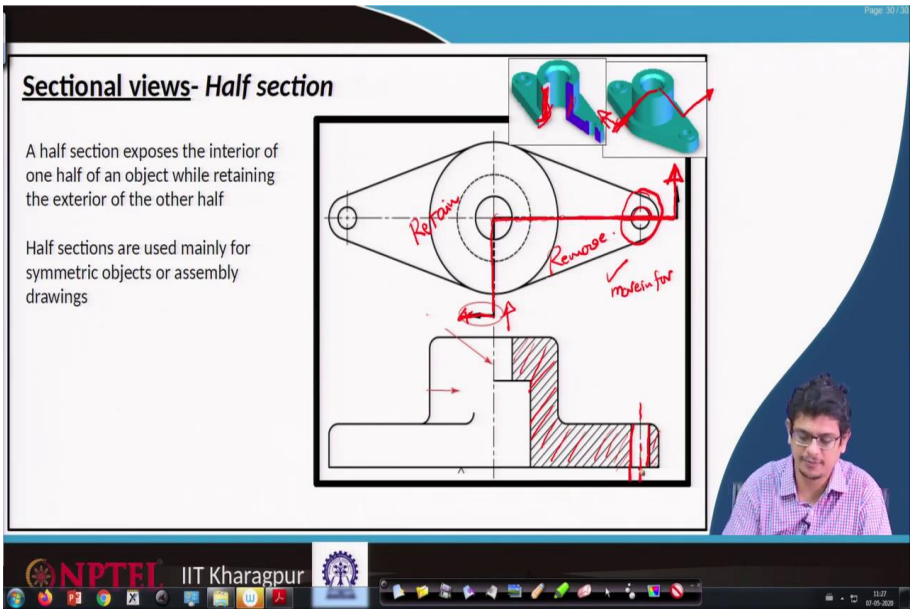

So, that is a reason we have this plane information which goes and we want to remove it in this direction also. So, it goes and this. So retain, remove; in half sectional views by if it is a full section it goes all the way there, we do not require that. So, this part whatever we are going to get represents more information of the object.

Here more information in the sense like, we will be in a position to see that hole, that hole is not there and this portion has the same material as this. So, we do not require to show this hatching thing. So, if I am visualizing this object, this part where the hatched portion is there we have that hatched lines. And, because this is the hole, we have that bore there and there is an axis line which passes through that.

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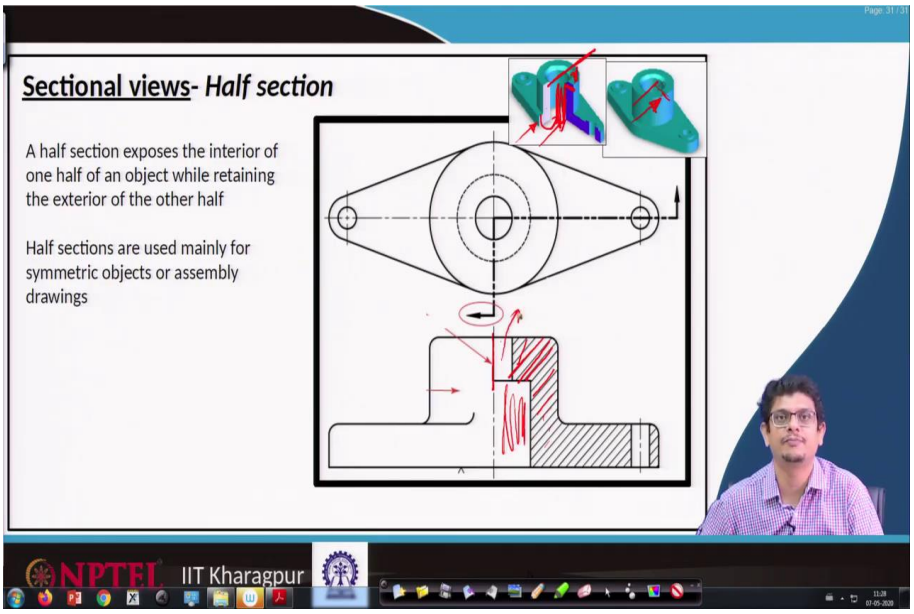

Because, it is a half sectional representation, this object whatever we are slicing it maps the remaining cut sectional thing. So, your cut section you will be in a position to see only from there. So, there is a gap between this one and this one. So, whatever that cut section we have that we can see there and this white blank space, that white blank space is that. And the material is only removed from here, but not from the centre line.

So, from the centre line, you have the bottom backside object which comes out like material without any cut view.

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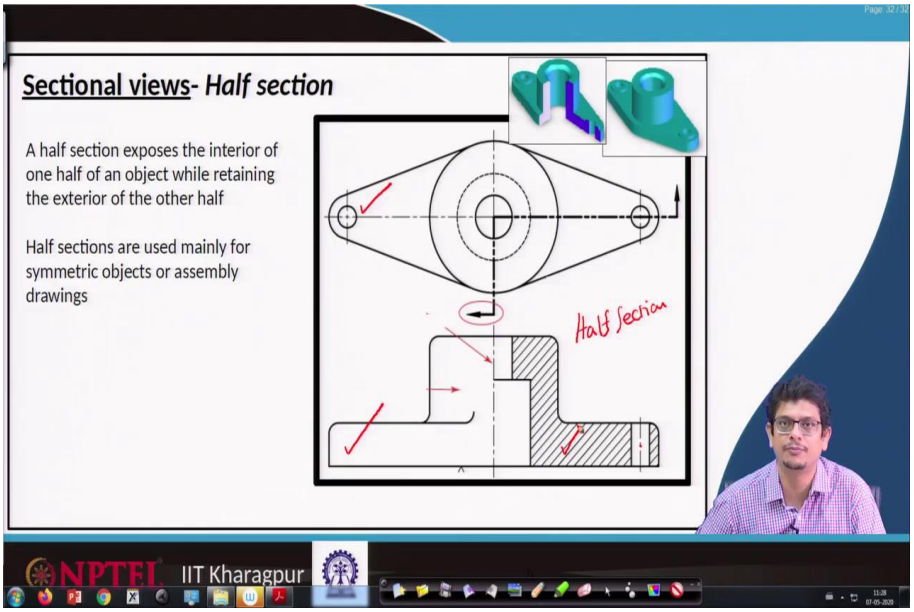

Such kind of objects or views we call half sectional views. This simplifies the entire object saying that we do not have to show for this, that will be symmetric on this side also. So, it is an easy way of communicating with anyone saying that there also hole and it is asymmetric kind of object and left-right symmetry you have and just showing this part is good enough.

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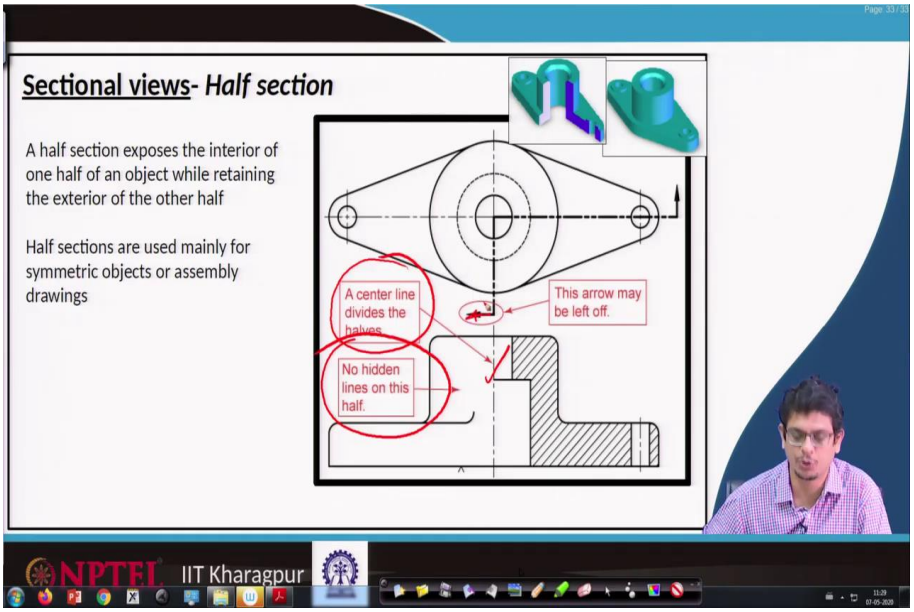

So, as I said we do not, we should not show any hidden lines on this half. And, there should be a centre line dividing that halves and arrow direction represent our retaining portion.

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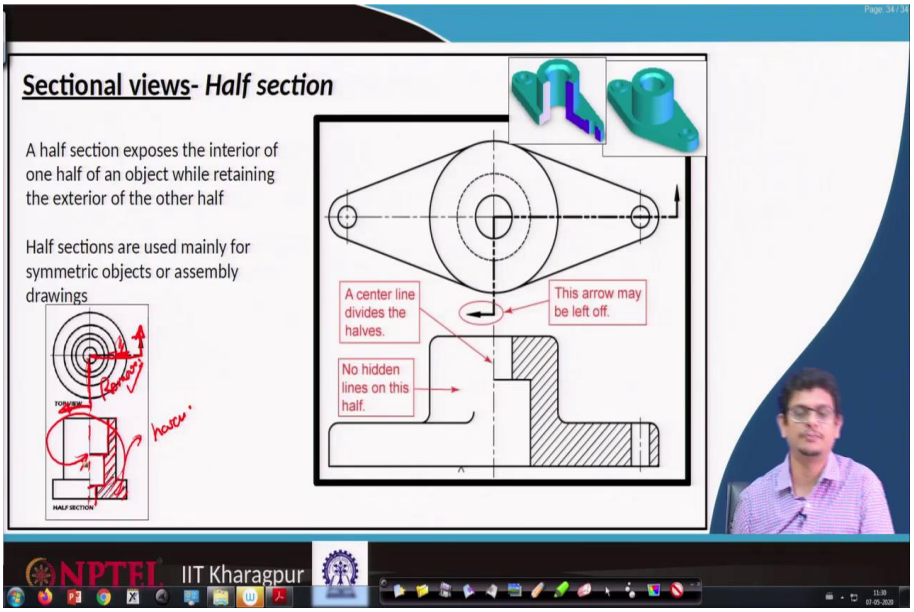

Now, let us pick another object. Again we have this symmetric object here and we would like to retain this part, remove this part. If I remove that, we have this material, the material is there. So, that material what we are having is these hatched lines and that extends all the way there and that extends all the way there.

So, we are showing that one as hatched lines. Now this one maps on to that; so, you will be having a centre line and this material is projected. So, there are no hidden lines we will be having and is symmetric in this round direction.

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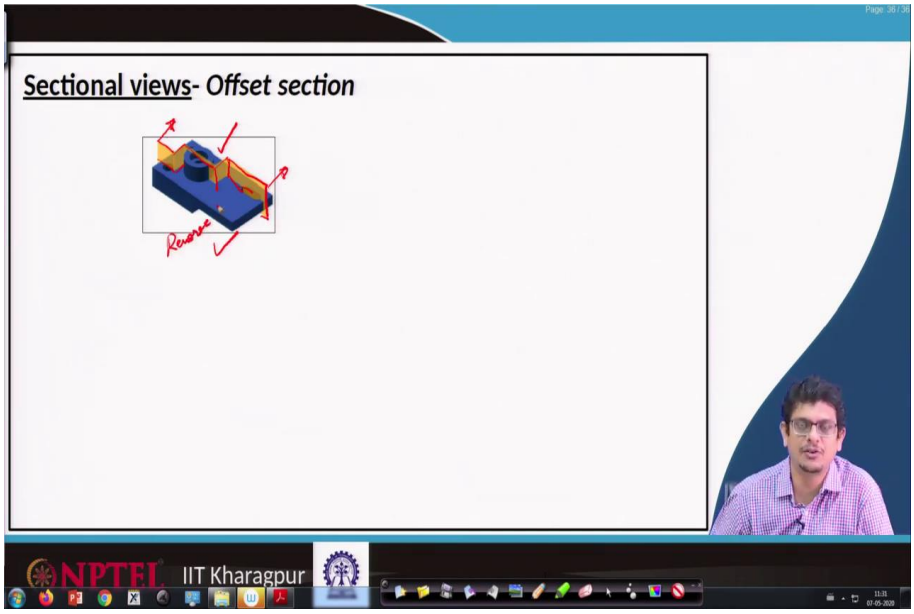

Now, let us look at another view which we call offset sections. Instead of having a sectional plane at one location, if we have multiple planes passing through the object to represent interior parts of that machine element; then we go with this offset section. For example, we have this bracket, I would like to have a plane comes in that direction goes, again pass through that object goes comes, again goes. This kind of section I would like to have it. If that is the case, if I represent arrows in that direction; that means, retain that, remove this part.

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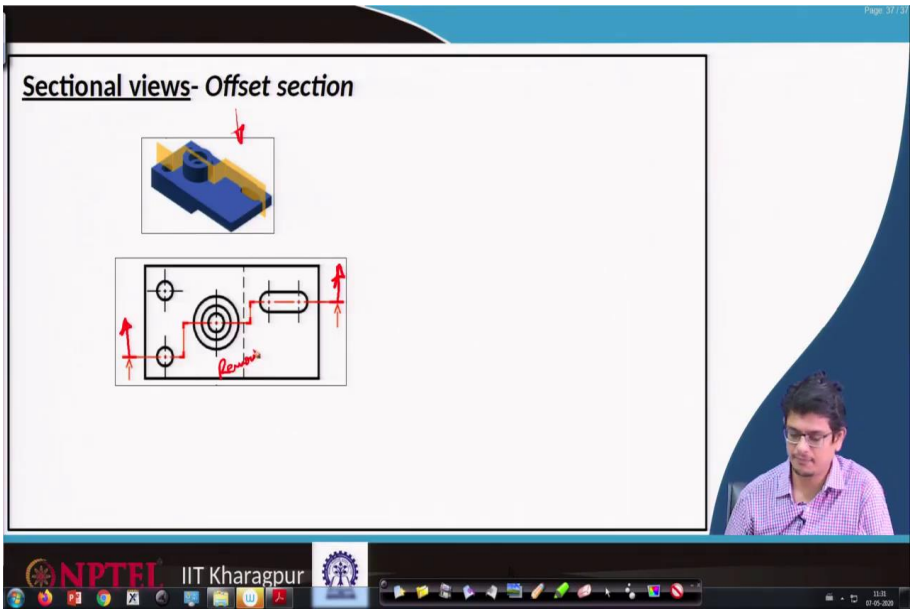

Let us visualize cut sectional view in an isometric way. So, if we are looking from top view retain this part, retain this part, remove this.

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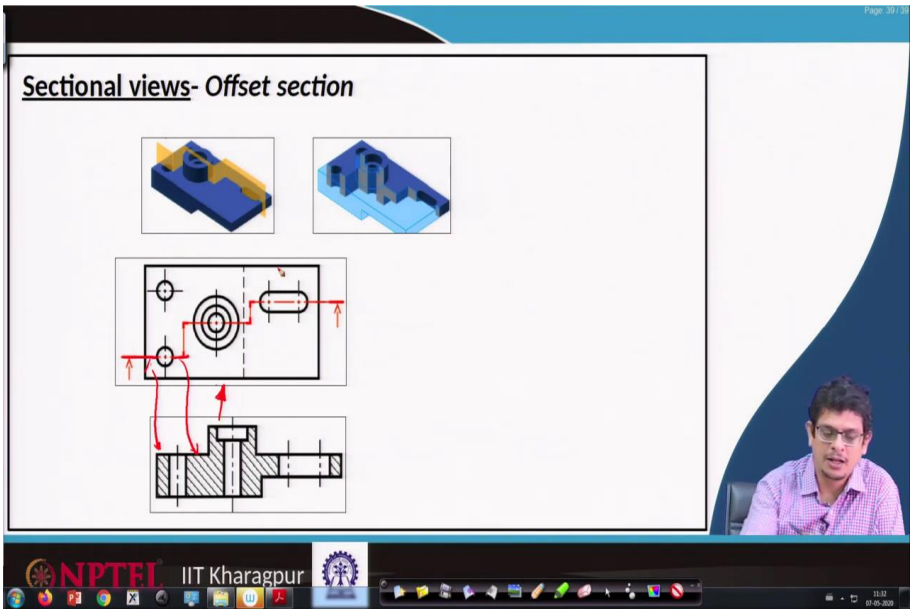

So, at the isometric level, we want to remove this cyan colour and retain the blue colour. If we do that the cut sectional view, the offset cut sectional view what we will see is because of a plane pass through this. So, this part supposed to be material element and these are projected views. So, we have after removing that we have to visualize it in that direction. So, all these parts will be projected.

When we have that kind of projection, we did not remove any material there. So, there is no material removed that is just like a bore and this part we will be having material, this part we will be having material. Now, its again we will be having a hole passing all the way there. So, we have this continuous lines material. So, the material is present, then again it comes all the way here. Material is not removed; so, the material is not removed. So, the projected views we have to see on that object.

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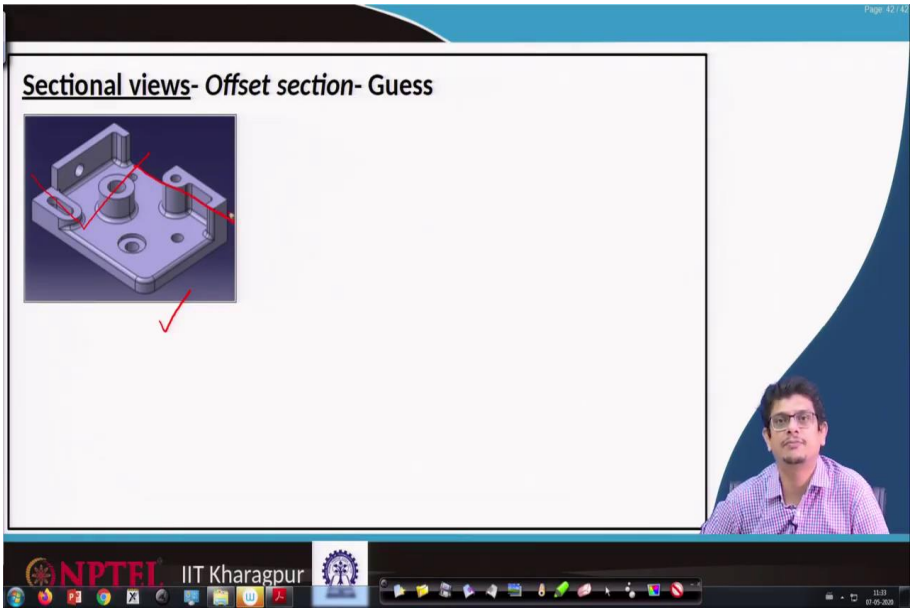

Now, if I have this material, if I have this machine element; can you guess the offset section at different planes? For example, I would like to have something like this, take that, again comes to pass through that. If that is the case how it looks like?

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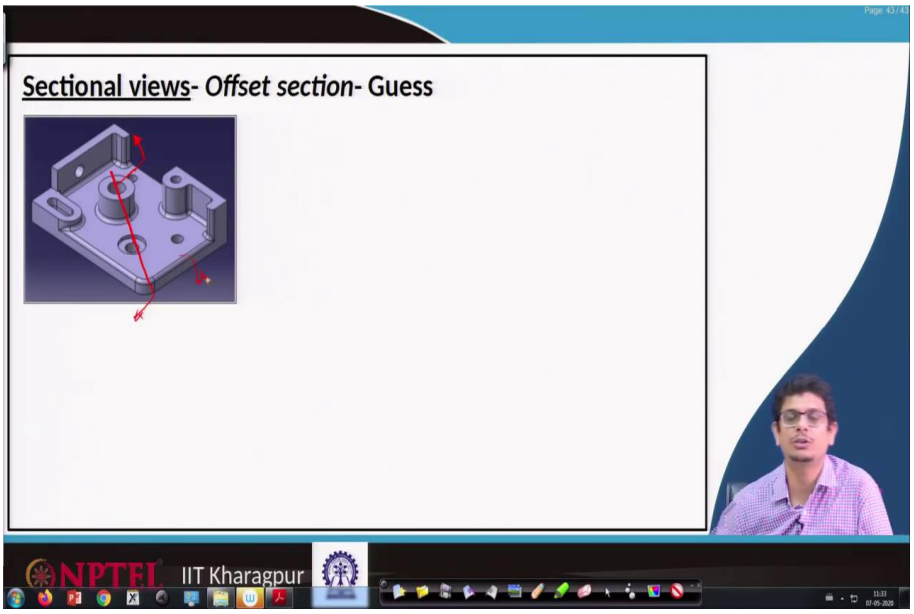

If I have something like this pass, comes in that direction, retain that part, retain that part and remove this. How does it look like?

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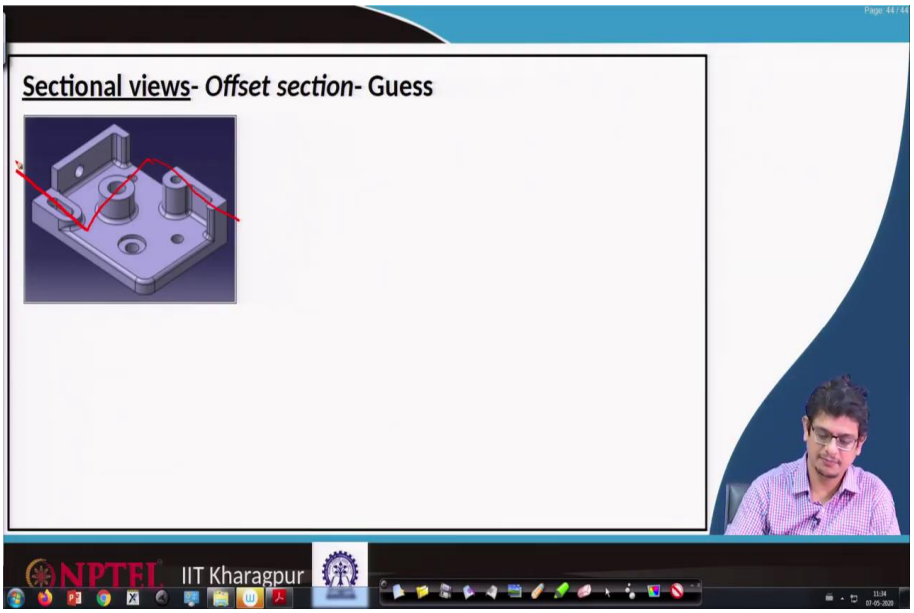

If I am having a plane in that way, pass through that and again pass through that; how it looks like? Guess those offset sections.

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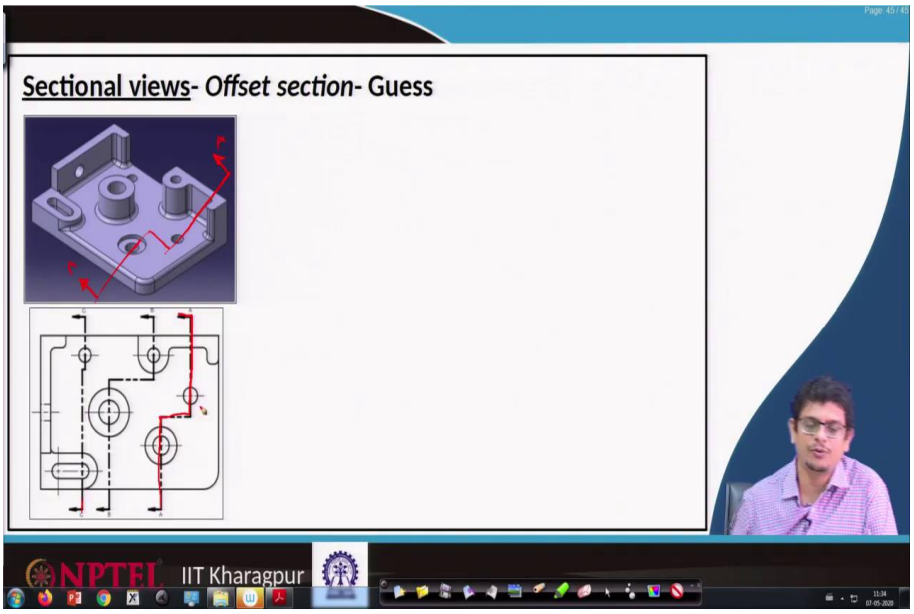

So, for example, if we are taking offset sections at different planes; for example, I want to pass a section goes, goes, goes, goes. So, over this hole, it has to go, come in that direction, again pass through that hole.

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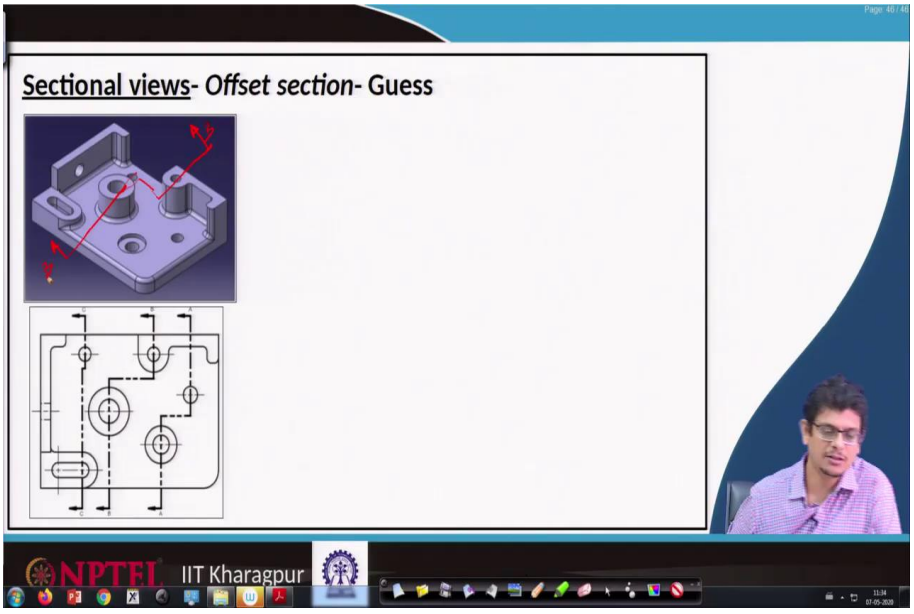

The second one I would like to pass through that, comes in that direction, again pass through that B.

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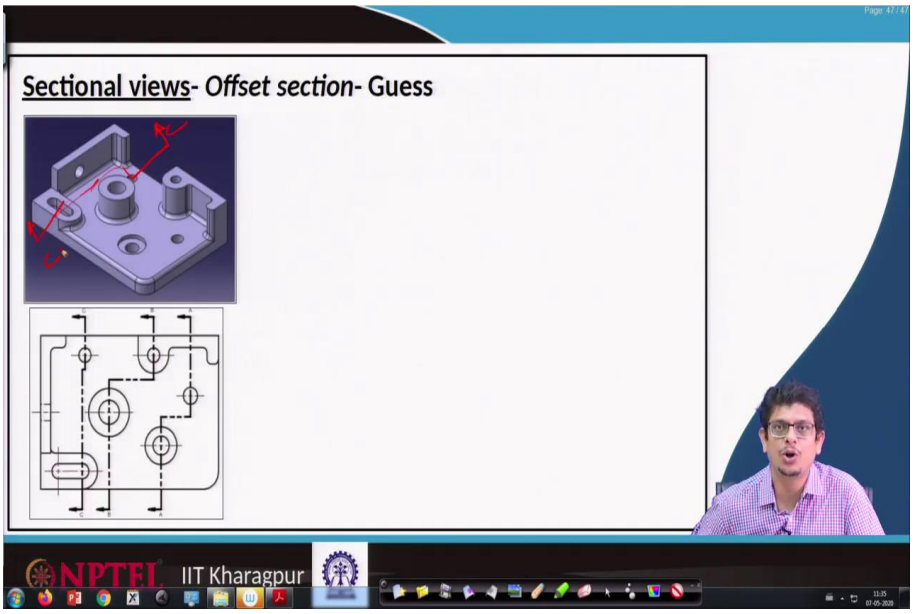

Similarly, I would like to pass a section in this way, comes goes; how it goes? These are the sectional views.

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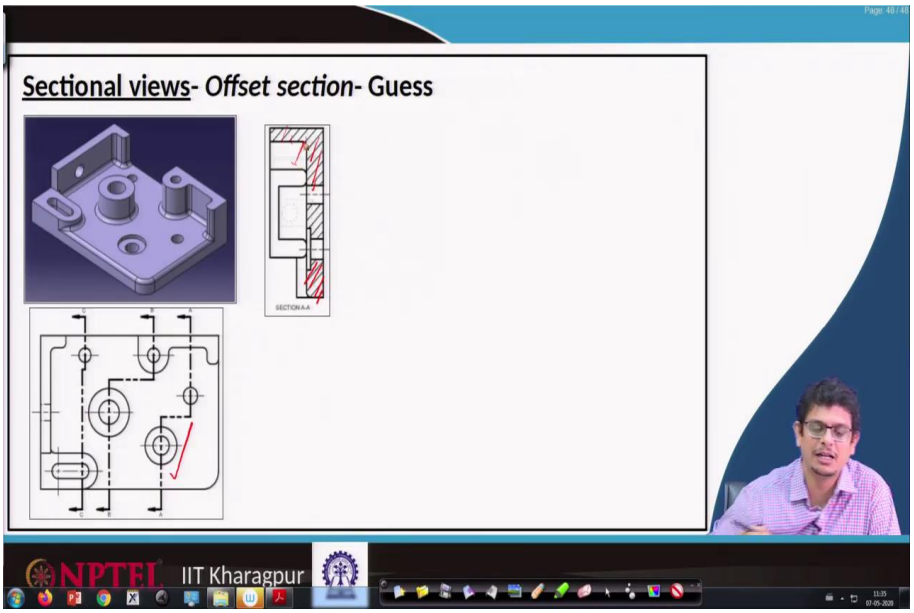

So, let us look at the solution. Section A if I am picking, if I am representing that, we will be having these material portions wherever hatching is happening. And, the places where the larger portions we did not remove any material that portion will be left blank.

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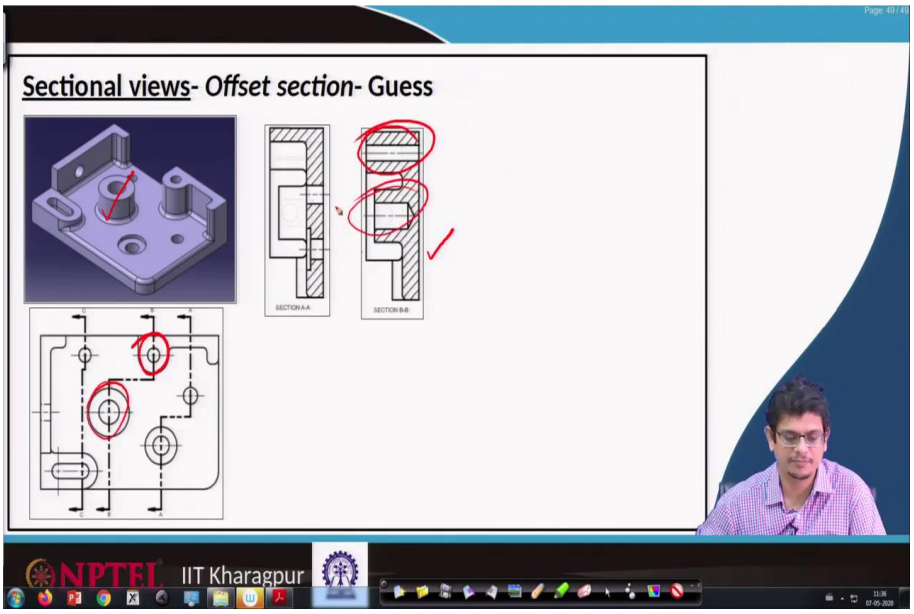

Similarly, section B if we are having it through this, how it looks like? This one represents this and this one represents tha.

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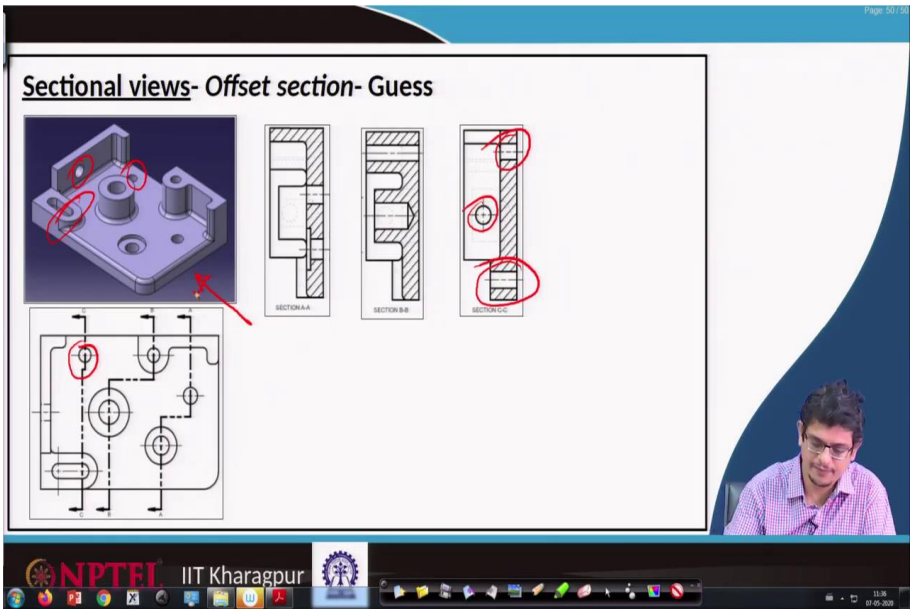

Section C, this is the section what we would like to have. There is a hole at below, there is a hole at below. And, we have something like a slot which is going all the way down, we are having that and we have this hole which we are going to show it in this way. So, this is the way the sections looks like when we are looking it in that direction.

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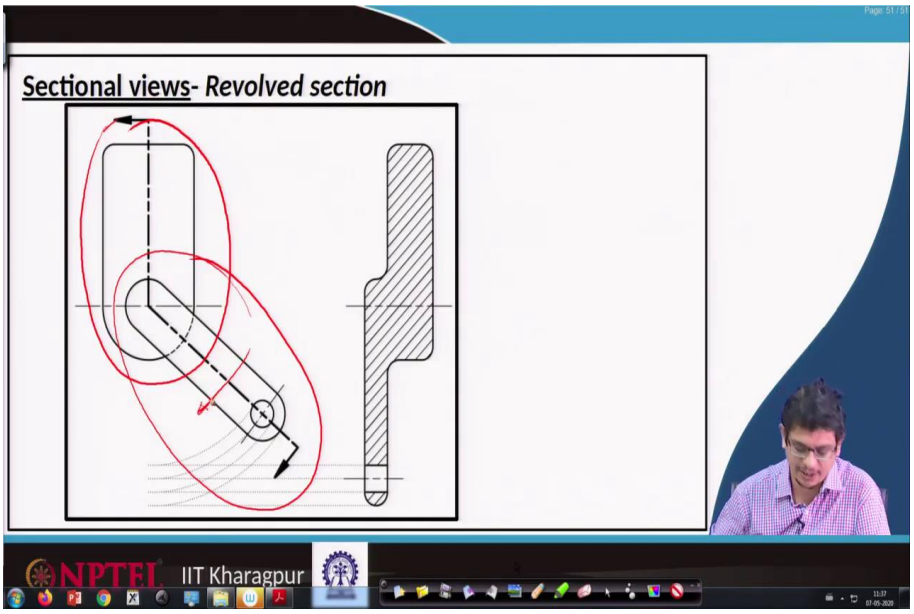

Now, let us look at revolved sections. For example, if I have an object having two materials, perhaps it is more like a pendulum kind of thing which is trying to swing. And, these are connected with each other.

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Now, we would like to have a section passing through that and also passing through that in that way. So, slice along that plane remove that, slice along that plane remove that and retain this one.

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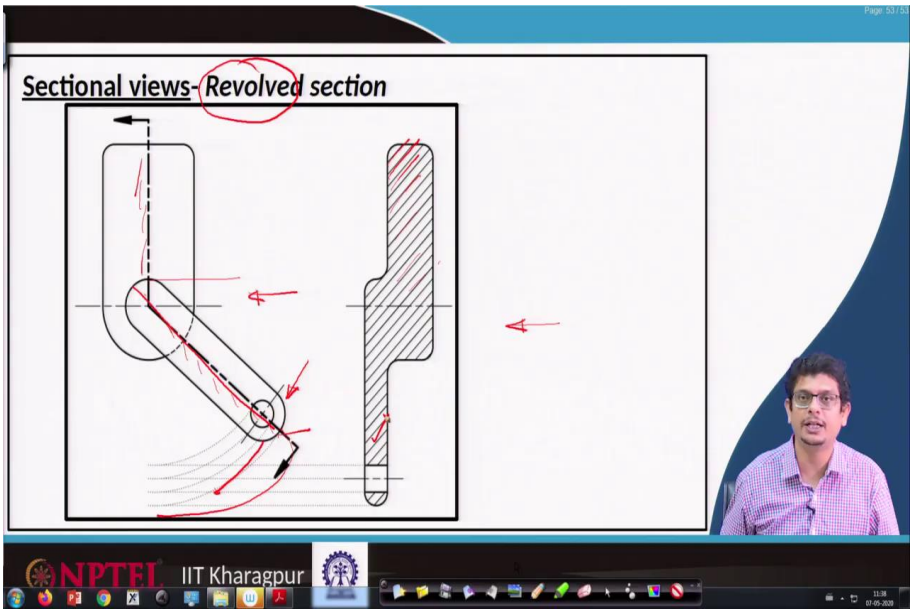

When we have such kind of object we are chopping this material. So, show it by hatched lines. Now, this object we remove, but we would like to view that on the projection plane. So, what we do is after removing this entire materials thing, we revolve it down all the way; because we would like to see something like a complete view in this direction.

If I am straight away looking from a side view, it will be up to this portion we will be in a position to see. But, we will not be having information about how large or long it is. For that purpose what we do is by knowing it is as a revolving section, we rotate this object downwards, remove that portion show it.

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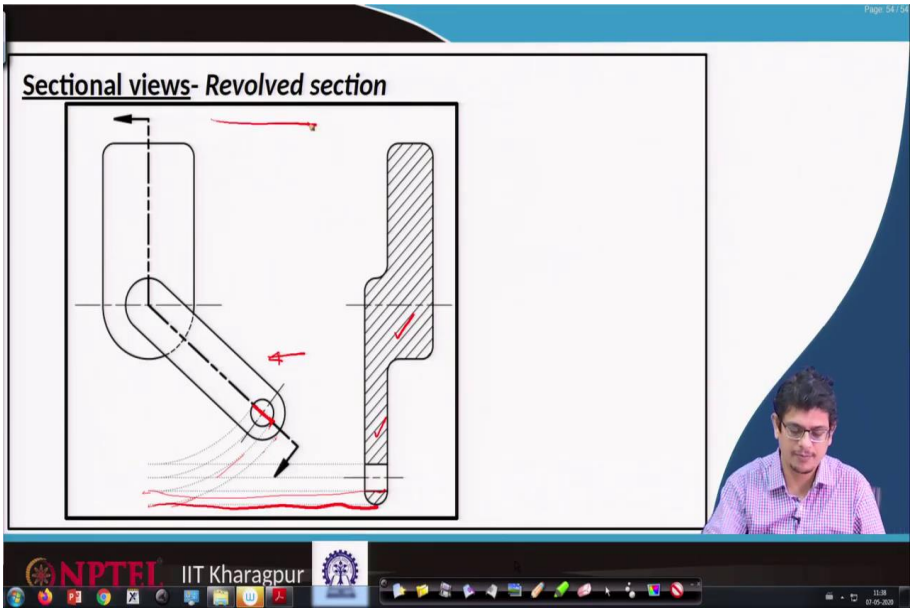

So, if you are seeing this projection lines after revolving whatever that line, this part coincides with that. After revolving that part, showing that it coincides that. So, we will be having in some sense what is that true information of that object rather than just projected in that way. So, that we will be in a position to see the drilled hole size and other interior details. If we are having that kind of objects, we call that as revolve sections.

So, in today's class we have learned about full section details, half-section, offset section and revolve sections. In the next class we will learn about rib and web sections, aligned sections, broken out, removed and machine elements.

Thank you very much.