**Engineering Drawing and Computer Graphics**
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**Lecture – 64**
**Assembly Drawing (Contd.)**

Hello everyone. In the last lecture, we learned about some basic assembly methods that were some standard mates available in solid works. Now, in this lecture, we will go on some to learn some advanced methods of the methods feature featured in SolidWorks.

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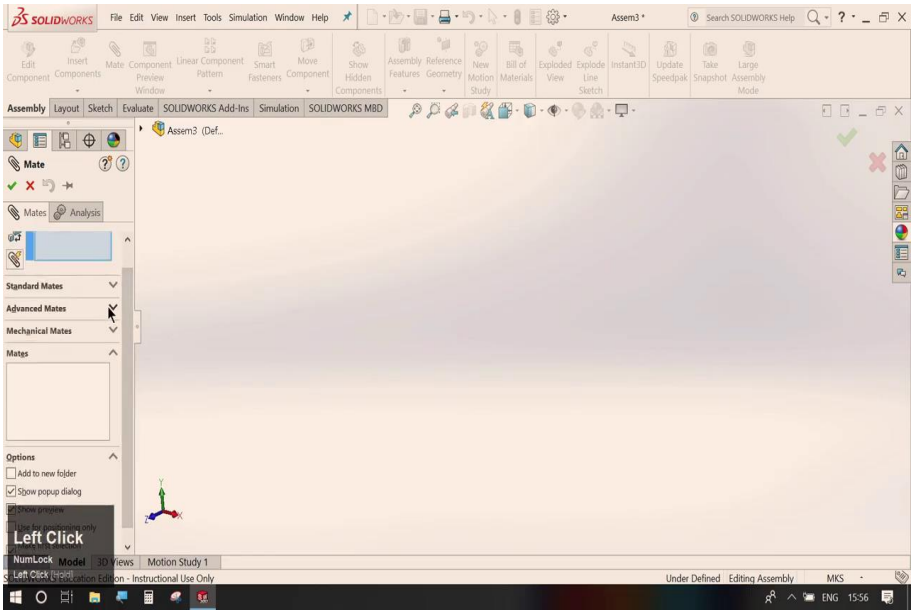


So, now let us see the mates; we learned about the standard mates over here. Now, the next things here is advanced mates. So, now, we will in this lecture, we will go about these advanced mates one by one.

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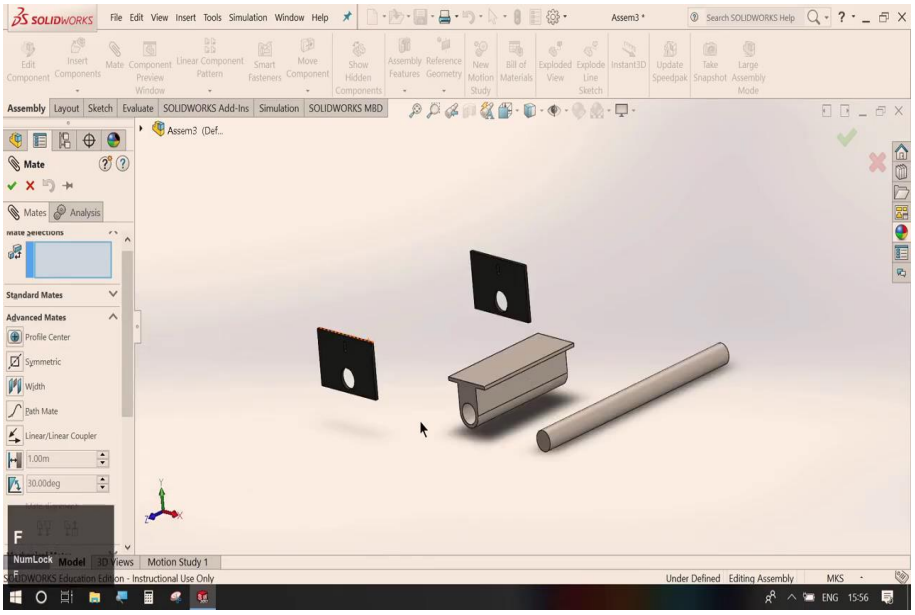


Let us see some of the parts I have loaded here.

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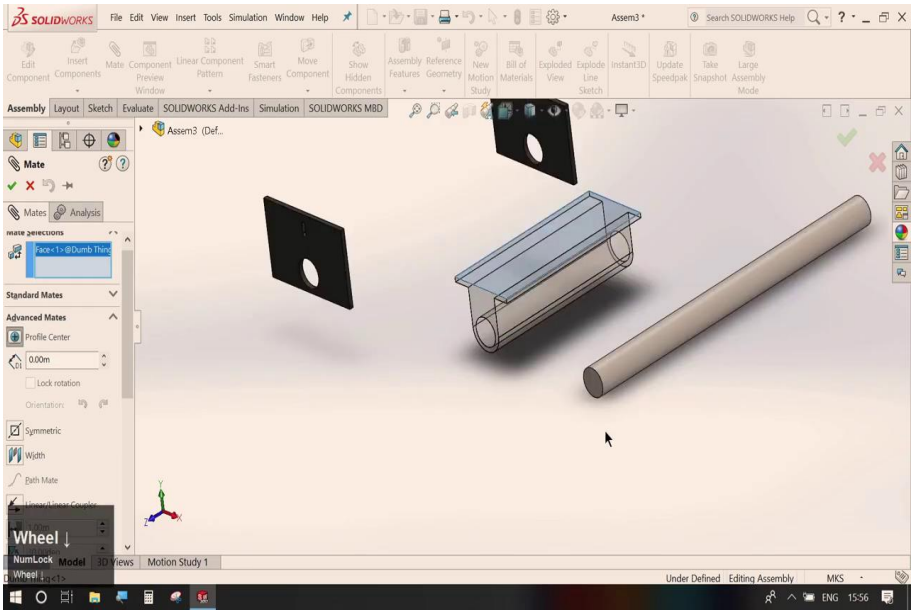


The first mate here is profile mate. In this profile mate, this profile mates allows us to align the centre geometric centre for two profiles or two surfaces to align over each other. For instance, let us just check this particular profile; this rectangular profile and the say this is a circle of this rod in the profile centre, now it automatically aligns the two of them to each other.

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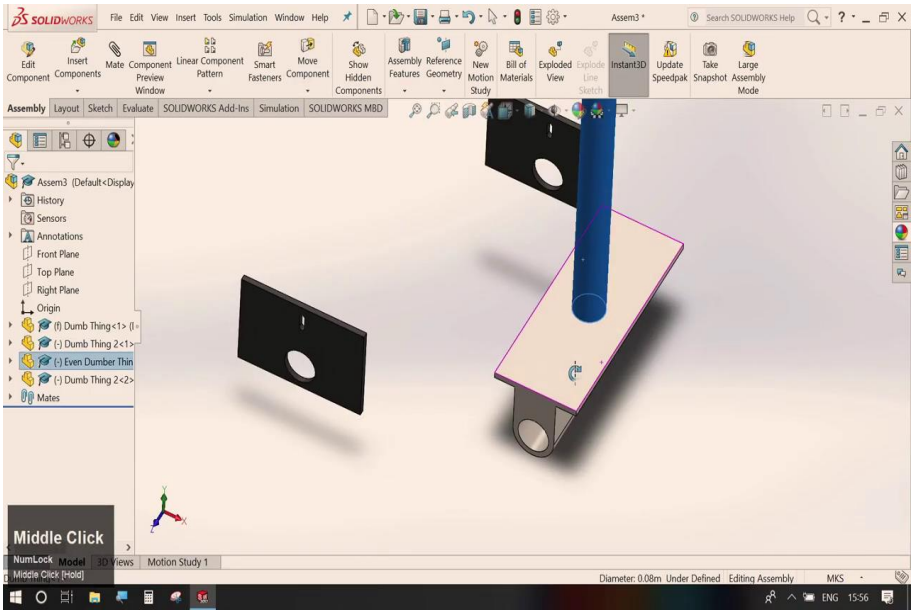


You can see these two getting aligned with each other. Once again, you can see say I want to align this particular face over this larger rectangle. So, we will go to mate, we will go to advanced mates; then, this is profile centre over here. So, we can see this plate is getting aligned, the plate centre of this face is getting aligned to this larger one.

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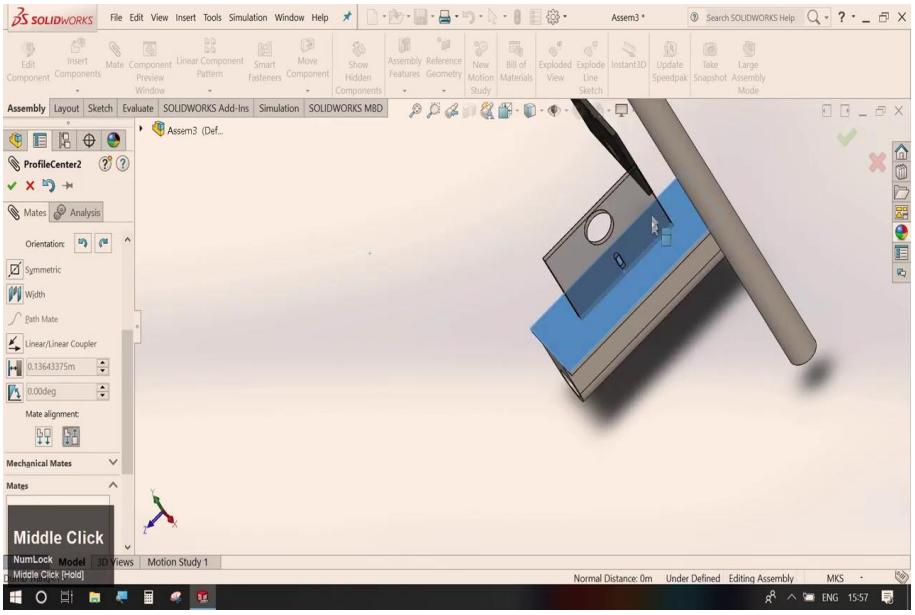


So, however, we can see this inverted to flip this, we have this we have the alignment option to invert the alignment. This is anti-aligned. So, we can see over here aligned correctly.

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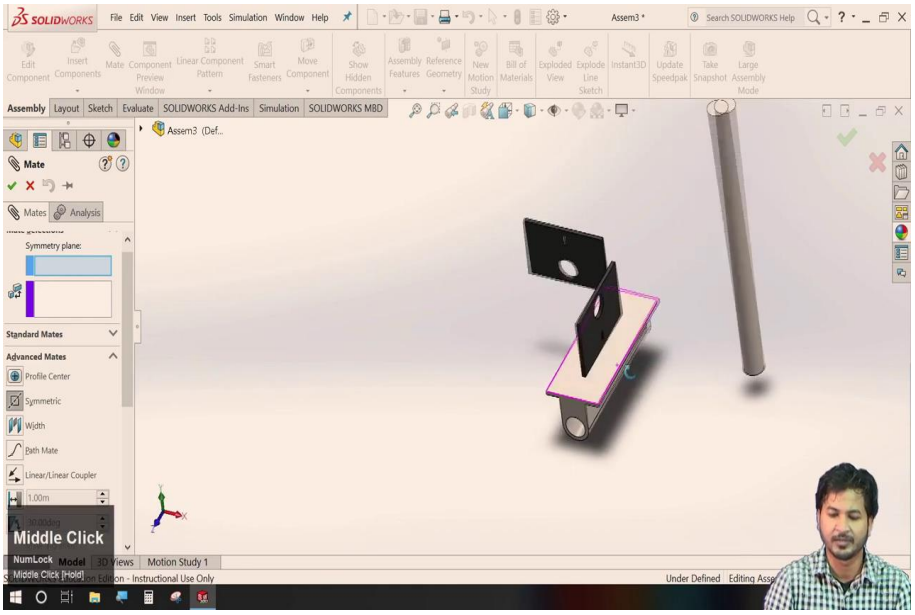


So, this here is the profile centre. So, for the next one that we have here is symmetric mate.

Symmetric mate allows us to move two items, two elements as a symmetry, we can couple them as if they were mirrored about a plane.

So, the next mate, we will talk about is in advanced mate is symmetric mate. Symmetric mate allows the two elements to behave symmetrically to each other along with a reference.

So, we will see here. Let me just set up the geometry for this. We will remove this profile centre.

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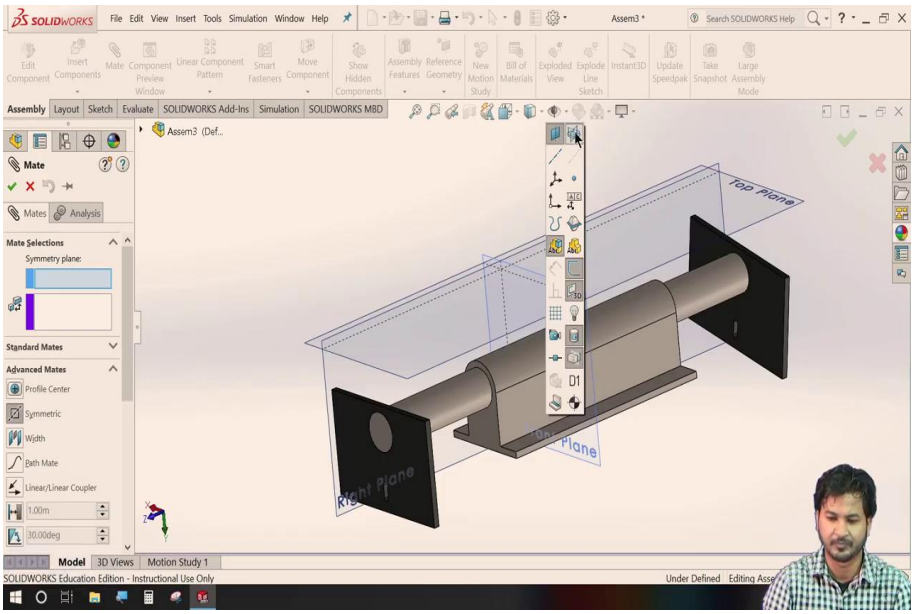

So, here we have some random fix say fixture assembly.

So, we can see here. This plate is rotating about this shaft; this is rotating about this shaft. So, let us just check the symmetric mate over here. So, we will go to advanced, then the symmetric.

So, this symmetric mate allows us to select two things. So, one we need to we need the symmetry plane about which our limits has to have to be symmetric about. So, let us select this plane or maybe we can select from these hidden planes.

Let us select this front plane from the middle. And we will select the symmetric plane allows us to select two items over here.

First one is we want to we have to set a reference about the plane. So, we will see the plane. So, we will go to mate to advance mate, then the symmetric one.

The symmetric plane allows a symmetric mate allows us to select two things over here, we can see. This is the symmetry plane; this is the plane preference that is between the two elements that we will be selecting.

Let us just select one plane it is, we will just enable us to see the plane. Let us select this plane and for two elements, we will be selecting this face and say this face, just click it ok.

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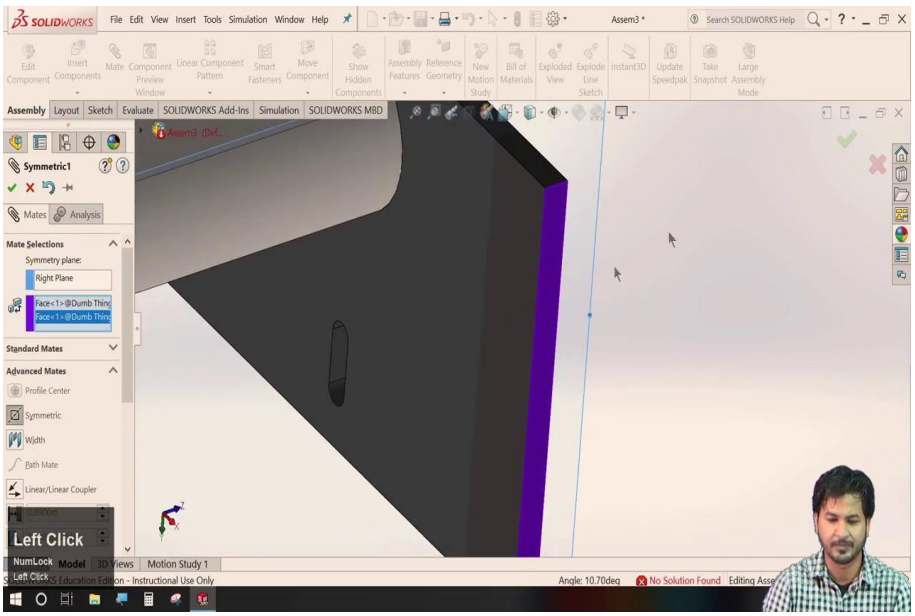


Ok again so, the next mate available is here is symmetric mate. We will go to mate and we will go to advanced mate, then symmetric. So, in the symmetric mate, we can see here two little windows.

So, first one of them is to select the symmetric; the symmetry plane of reference that that would be the reference for the two items that we will be selecting. So, for this plane of reference, let us just select say this plane and the two items that we want to be symmetric about, let us say this one and this.

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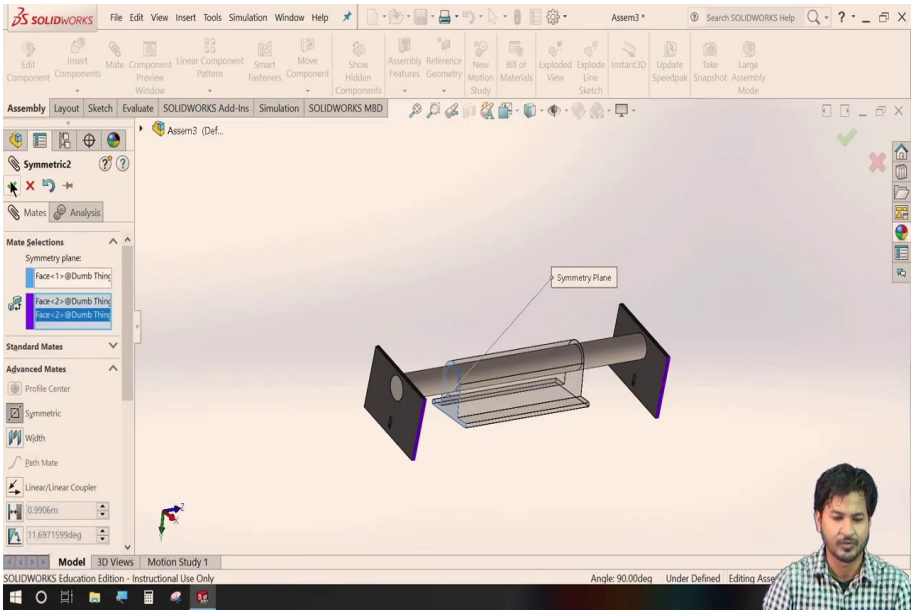


So, we will click ok. So, now, we can see this particular face and this face is symmetric about this plane of reference. So, as we rotate one of them, the other one behaves symmetrically about each other.

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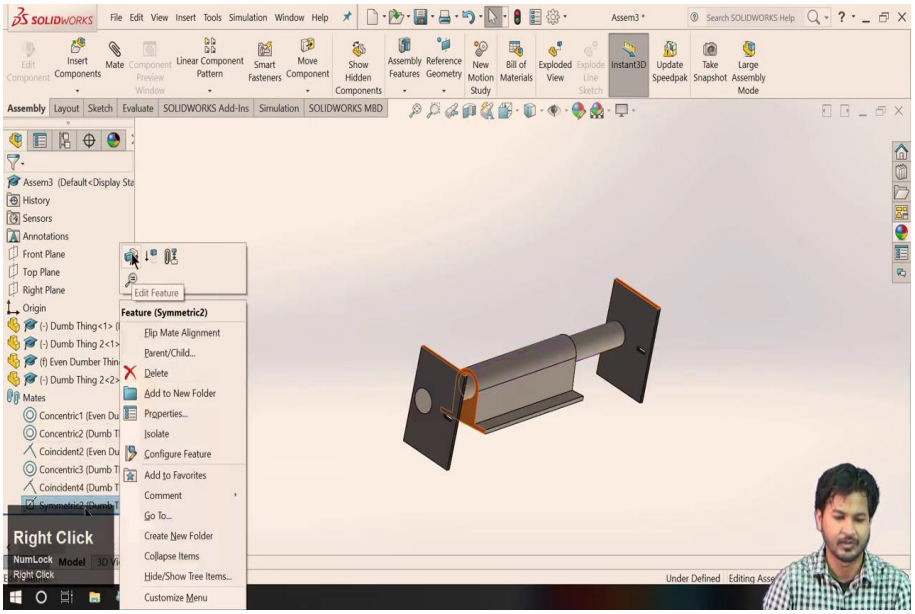

We can see the details again. Click right click over here and to edit.

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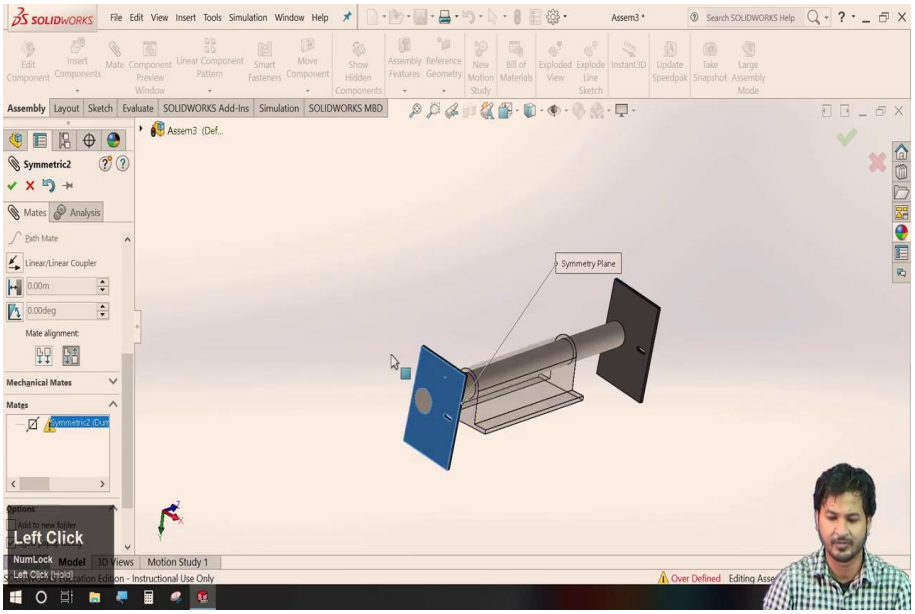


So, the next mate available over here is width mate. So, let us just delete the earlier ones; symmetric mate. We will see here, you can see this particular latch kind of thing is movable to any web there and it is not fixed that of as of now.

So, suppose, we wish to have this latch in the centre of the shaft, to have this we have the mate advanced mate called width. We will go to advanced mate width. Here again, we have two little windows.

This is the reference for the width selections. We will select its reference 1 reference 2 and the item that has to be in the centre say this one and this.

So, once we click it up. So, we can see this is fixed in the centre and it is in the middle of this plane and this particular plane. So, this is the width mate. In line with that, we will talk about the rest of the advanced mate. We will check with this distance mate. This is called distance limit and this is called angle limit. We will check with this.

First of all, let us just delete this width mate that we have just in. We will go to mate and this distance limit. So, for now, as I have shown you that this is movable to along the shaft and it does not have any limit. So, to set limit in on to this latch, we will just click over this.

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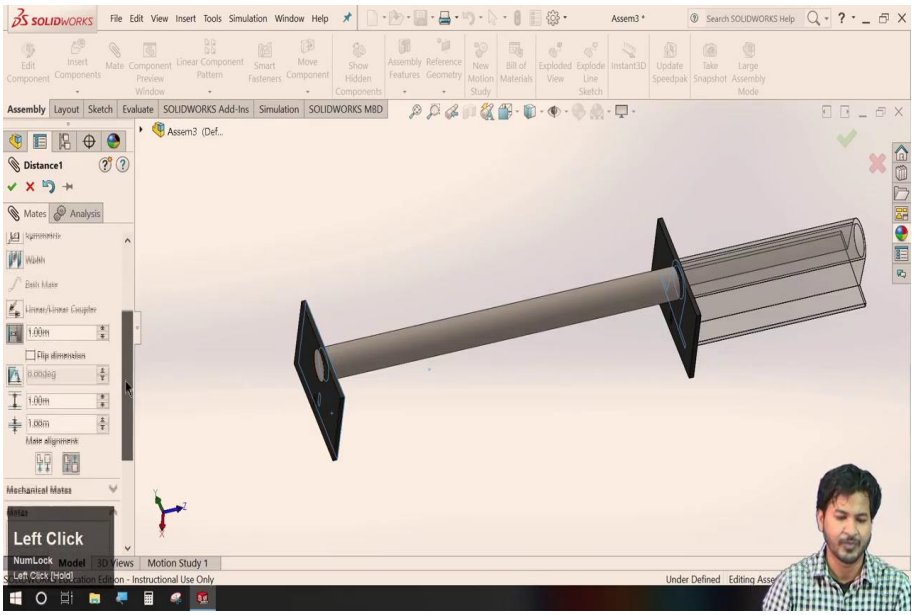


And it gives us a maximum limit and its another this is the minimum value. So, for we will have to select the face say this face and this face. So, we will select a maximum distance between these two and a minimum distance between these two.

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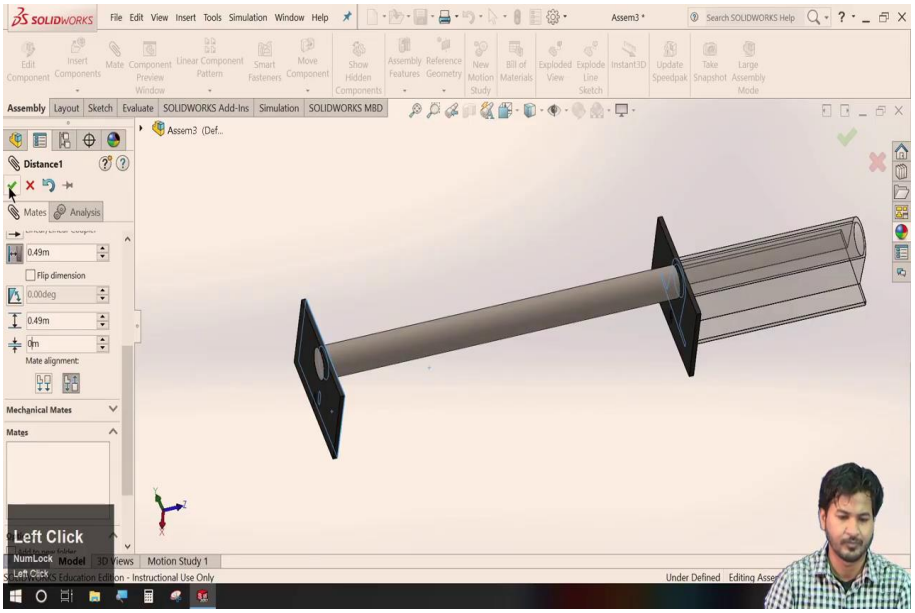


So, I am selecting 0.49 and say here it is 0; click ok. So, I must have set the limit between this face and this face. So, we can see the minimum limit was 0.

So, it cannot move beyond this 0 value and the maximum limit was 0.49. So, it has set up to a maximum distance up to 0.49. So, this is the distance limit. Similarly, we have an angle limit as well. To set angle limits, we have to again select two reference planes. This is the angle. We will select say this plane and this plane.

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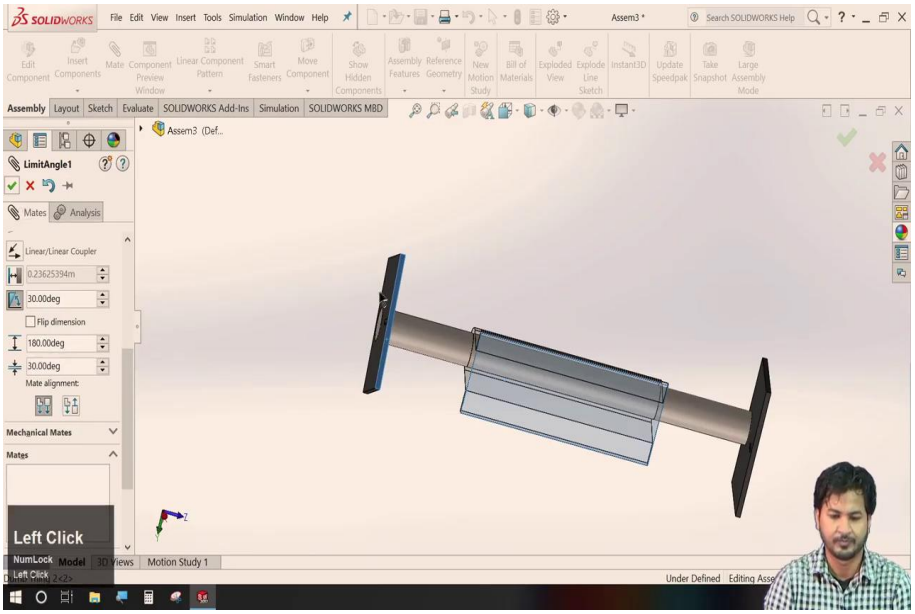


I am setting a value. Similarly, we have similar to the distance limit, we have here is an angular limit. So, we will go to advanced mate. We can see here angle limits. So, same as in distance limit, we have again the two selections to be made.

Let us just select this plane and this plane and will select a maximum value and a minimum value. Let us make it it will let be 30 and we will make this as let us make it 180; we will keep it 30 only; click ok.

We can see it has it cannot rotate fully, let us just fix this item ok; click on fix. Similar to the distance limit, we here we have is an angular limit also in the advanced mates.

This is for angular limits. This again, ask us to ask set the two reference plane between which the angles have to be set. Let us just select this plane and say the top plane.

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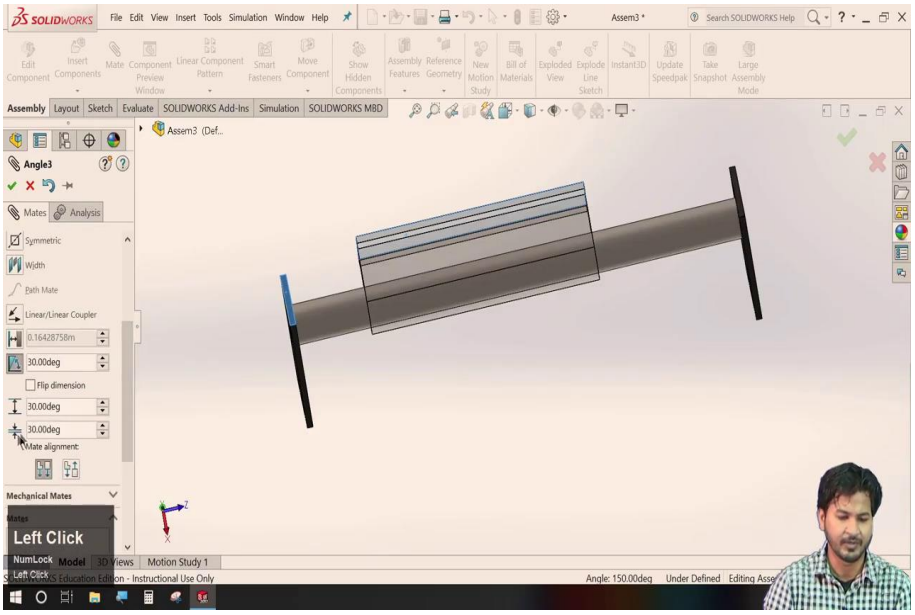


We will set a value that is maximum and one is minimum. Let us just select 30 to be minimum and say 180 as the maximum value. Now, we can see this shows a constraint motion in this angular direction. So, these limits are set up by this angular limit in the advanced mates.

So, this was angular limits, the other mates available here is in an advanced mate is path mate and linear coupler. We will see that let in some other geometry.

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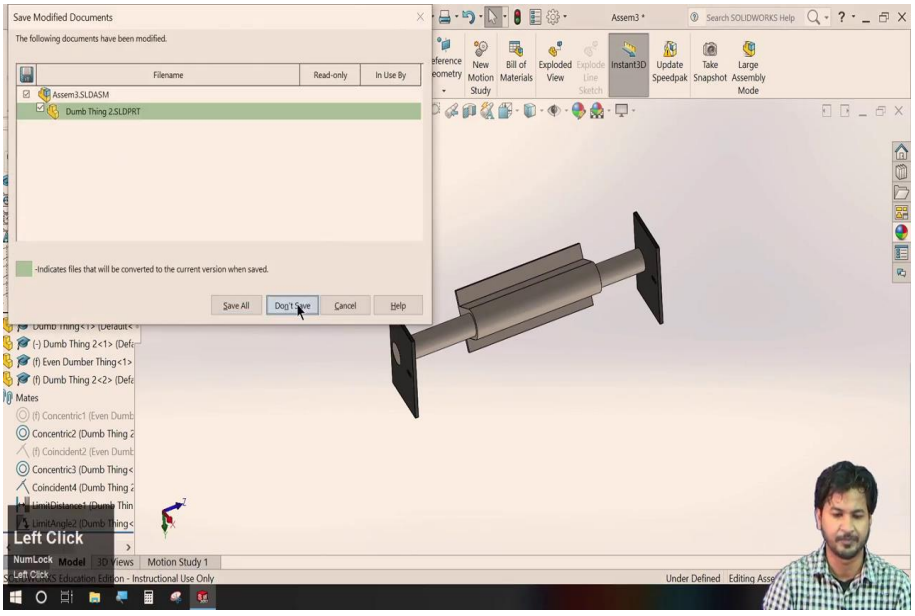

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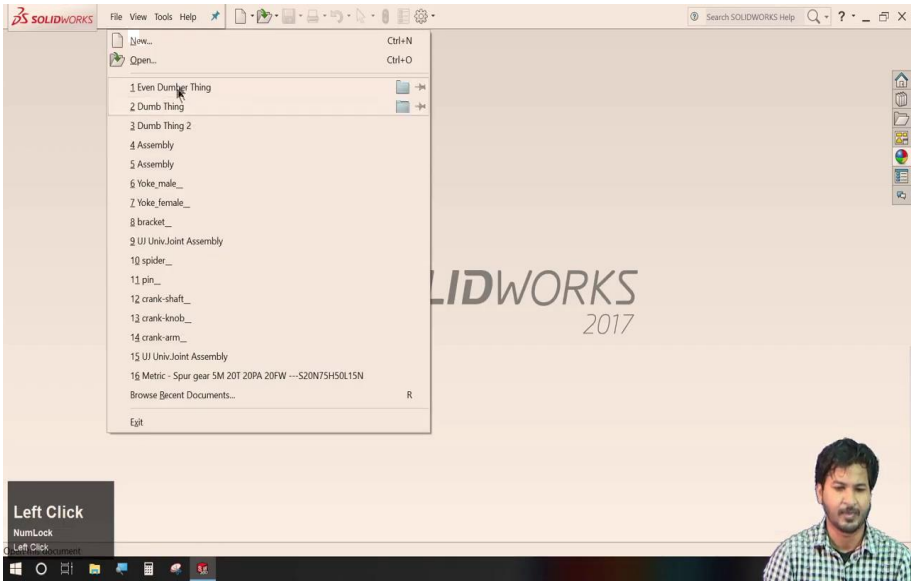


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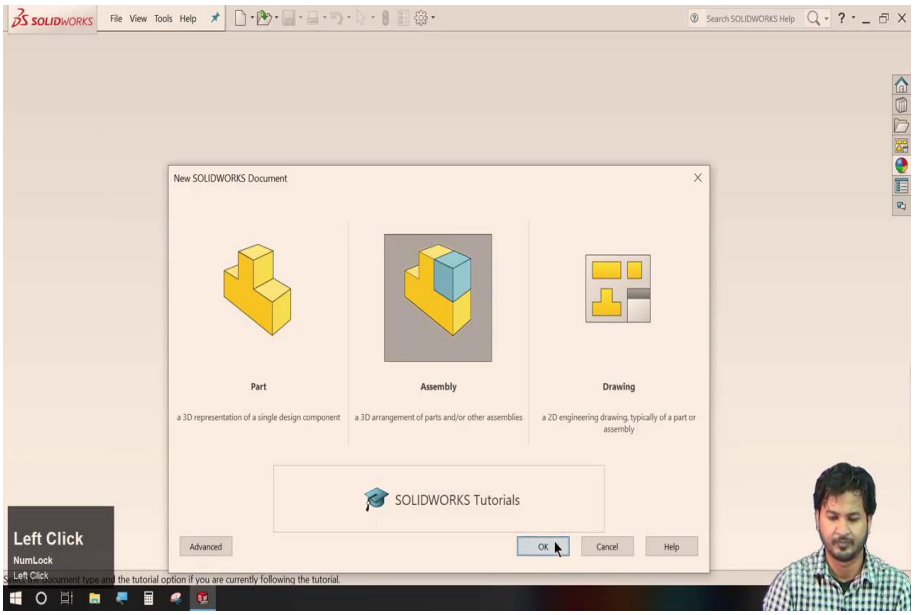

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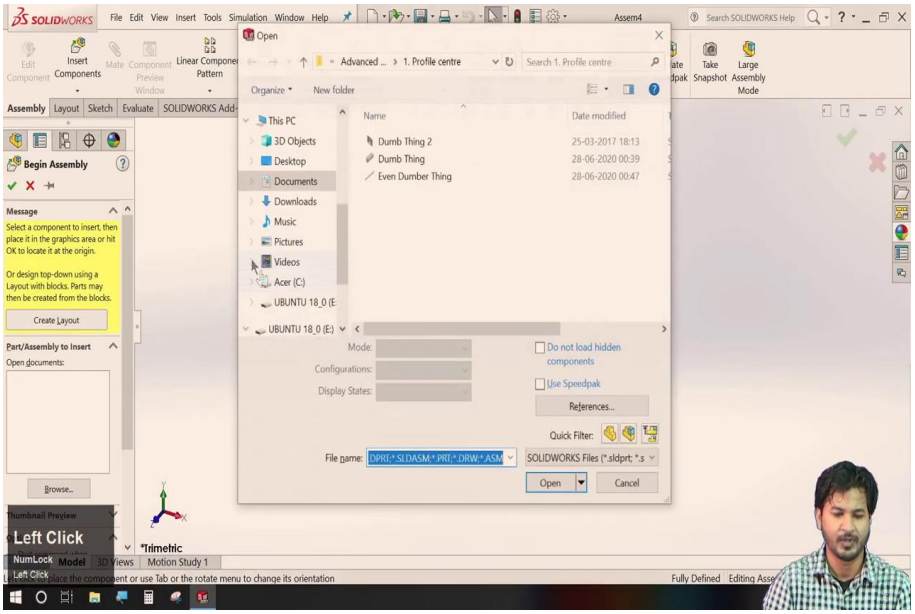


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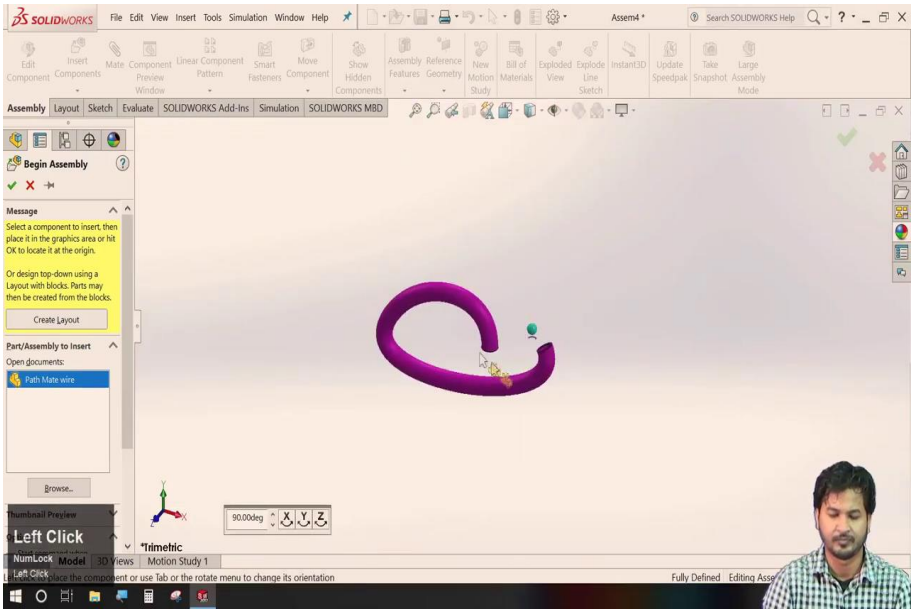


Just kill it.

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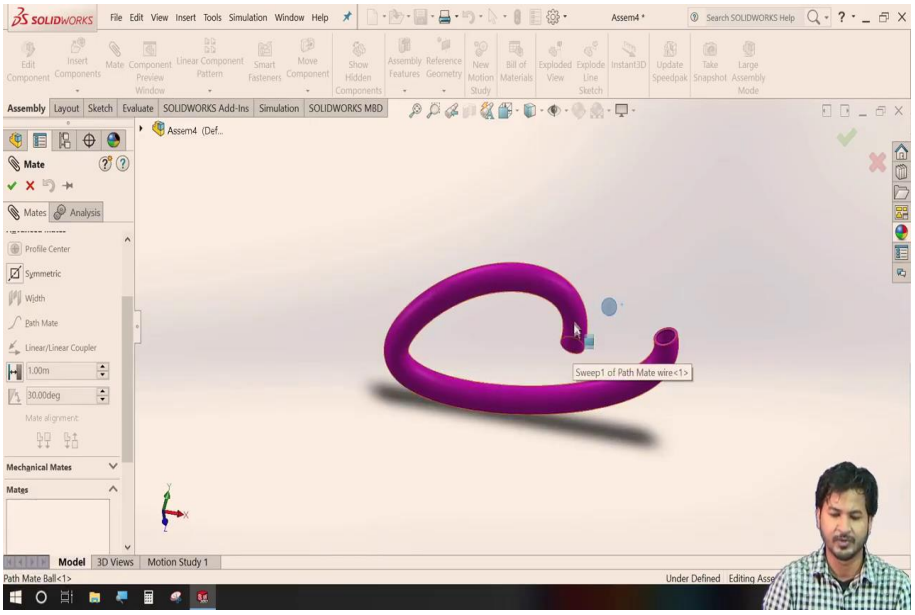


The other mate available in the advanced mate is path mate.

For path mate, we will see in this geometry that this ball is supposed to move into this curved slide. To make this possible, we will have to select the path mate.

So, for that we have we need the centre of this ball to slide along the centre axis of this slide.

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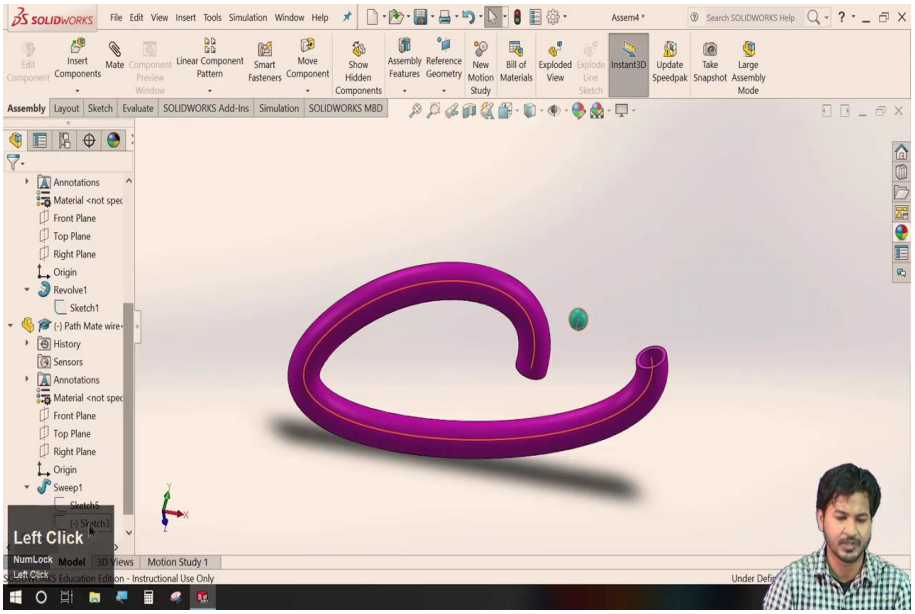


So, for now, we cannot see the centre of this so far and the centre line of this particular curve.

To enable that, we will go to this ball and we will select the sketch part and we will make it show and similarly, on this particular slide in the sweep, we will go to the sketch. So, now we can see the curve and the centre of this.

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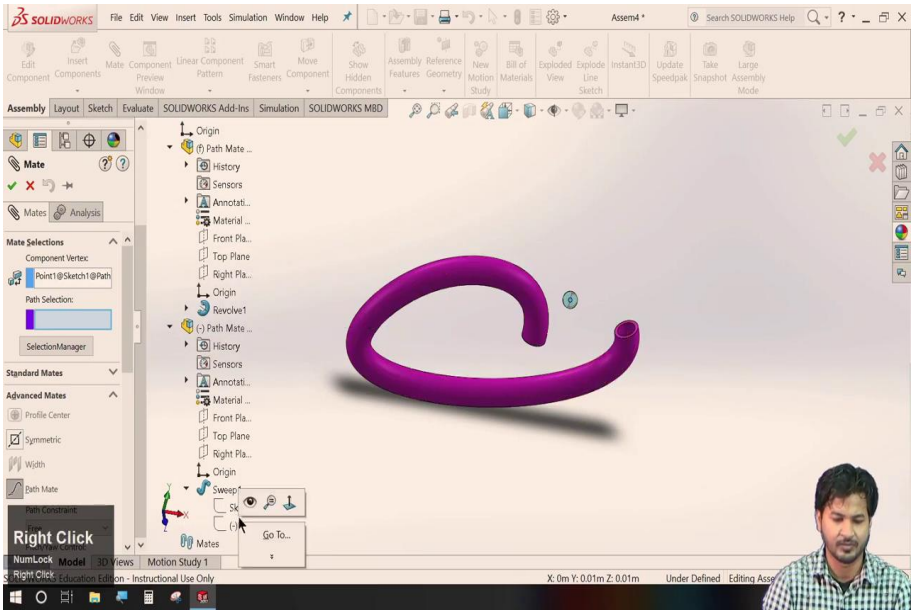


So, now, in path mate, the path mate ask us to for the vertex that is centre of this ball and the path that it has to travel along. So, this search let us just select the component vertex to the centre of this ball and the path as it is not visible as of now.

We will just activate here, sketch, make it show. So, now, again this path, we will click ok. Now, we can see that the centre of this ball is aligned to this spline of the slide; curved slide.

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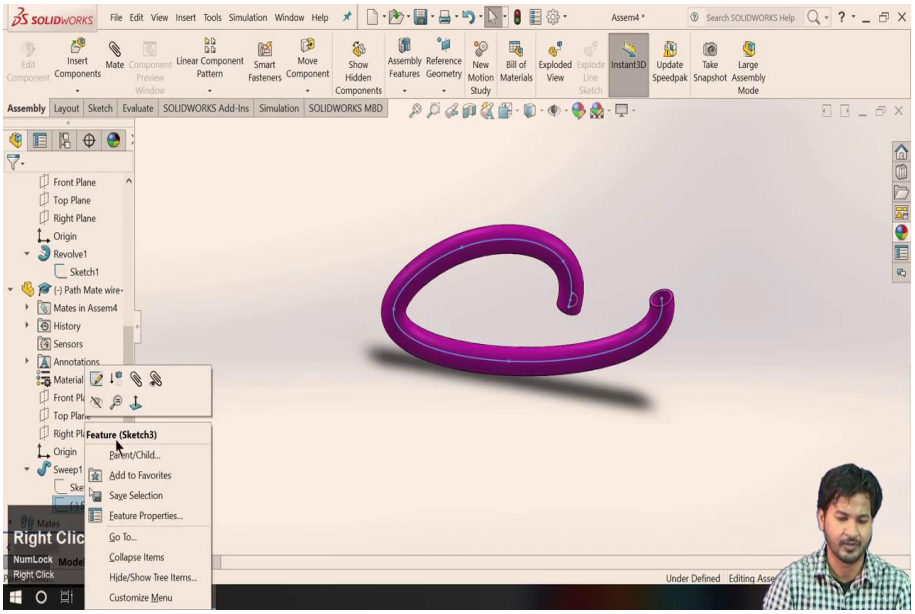


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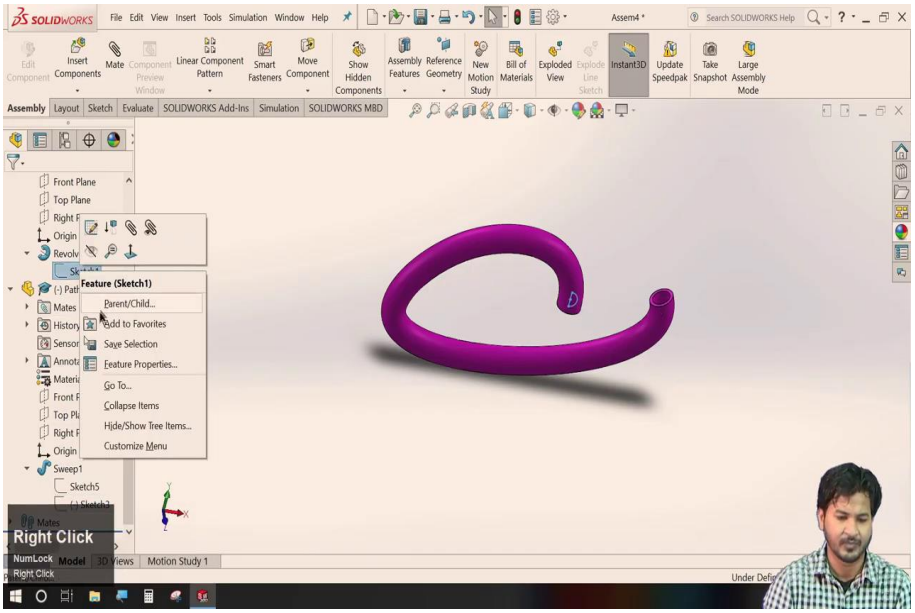


You can hide those sketches. I can see the ball is fit into this curved slide. To see that, let us just make this transparent.

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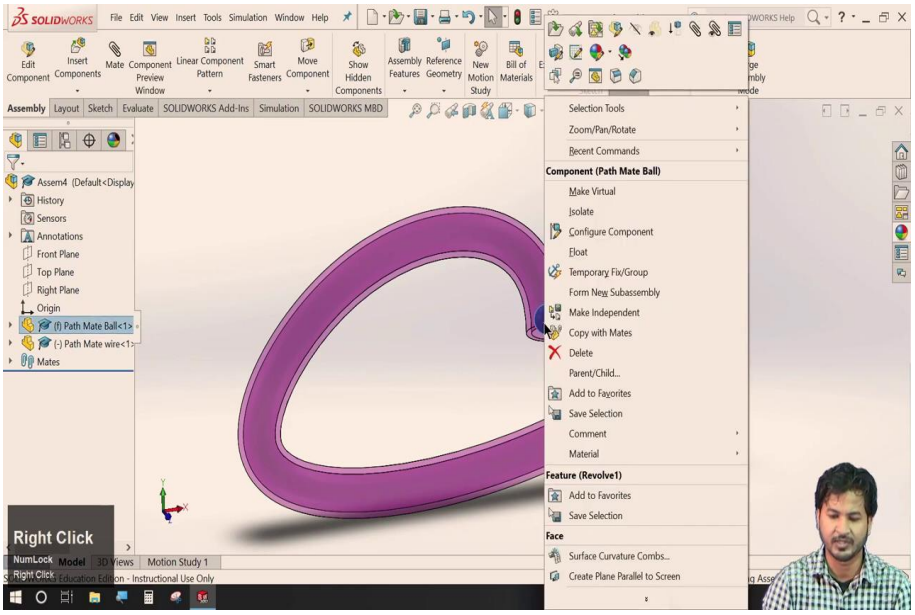


We will right-click over here in this change transparency. You can see here, this ball can move into this. However, as we know that we have imported this ball for the first and then this plane.

So, this is already fixed. So, let us just make it floating and make this fixed. So, now, you can see this ball can move into this slide. So, this was possible by using path mate. Let us just see the next advanced mate available, that is a linear coupler. We will check that on some other geometry. Let us just load it, I will delete this one.

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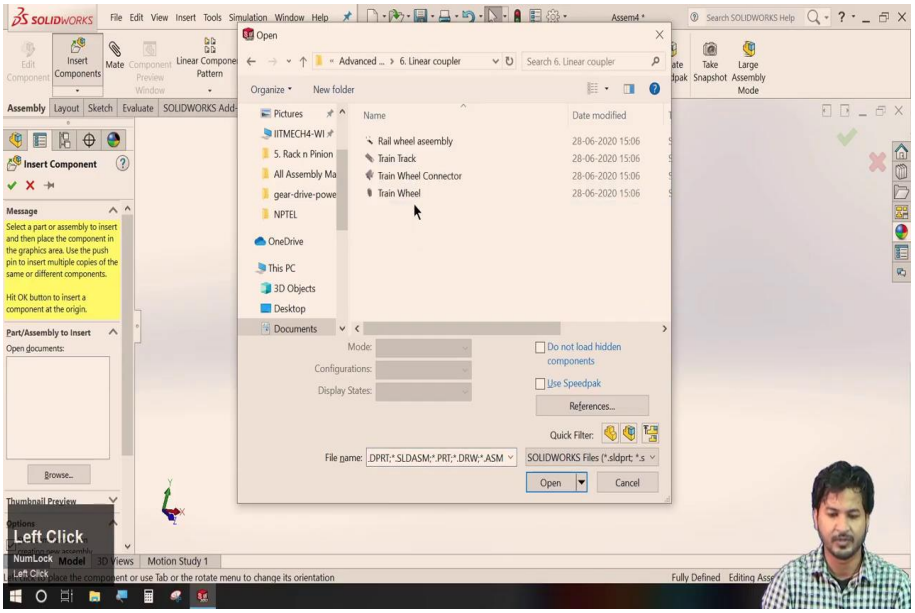


We will go to insert components for linear coupler; I am loading.

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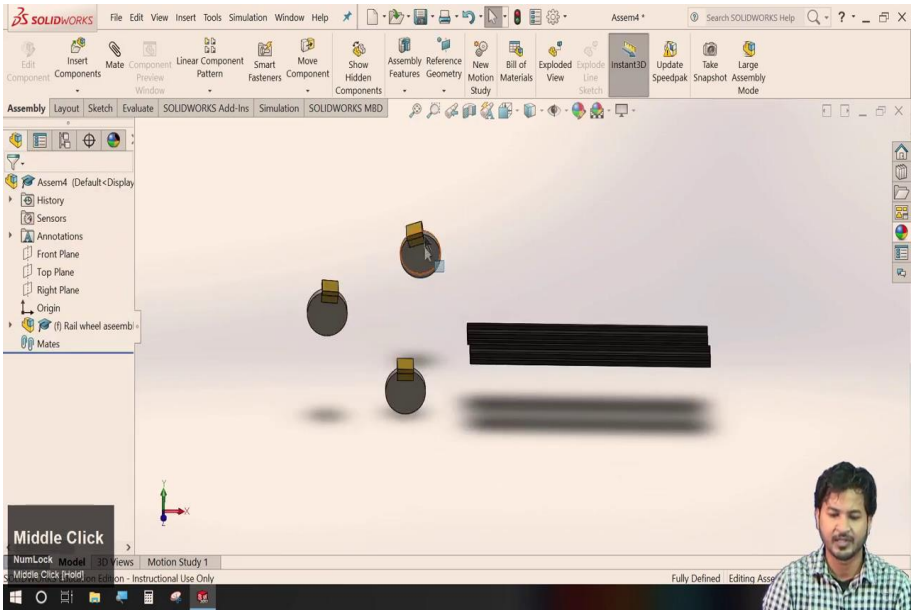


Here, we have some wheels and some rail tracks over here. So, linear coupler allows coupling between two items in a linear fashion; we will check that.

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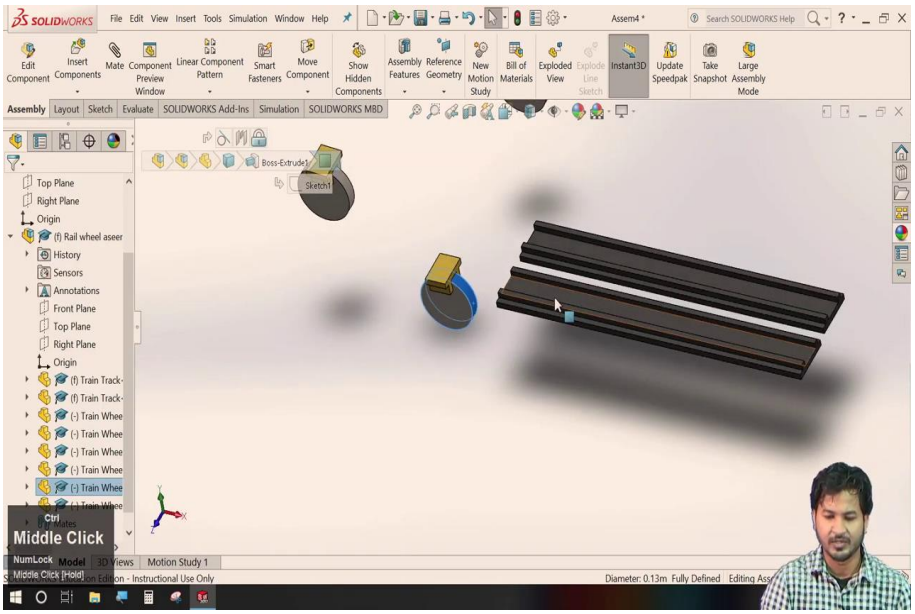


Let us just make these as tangent over each other

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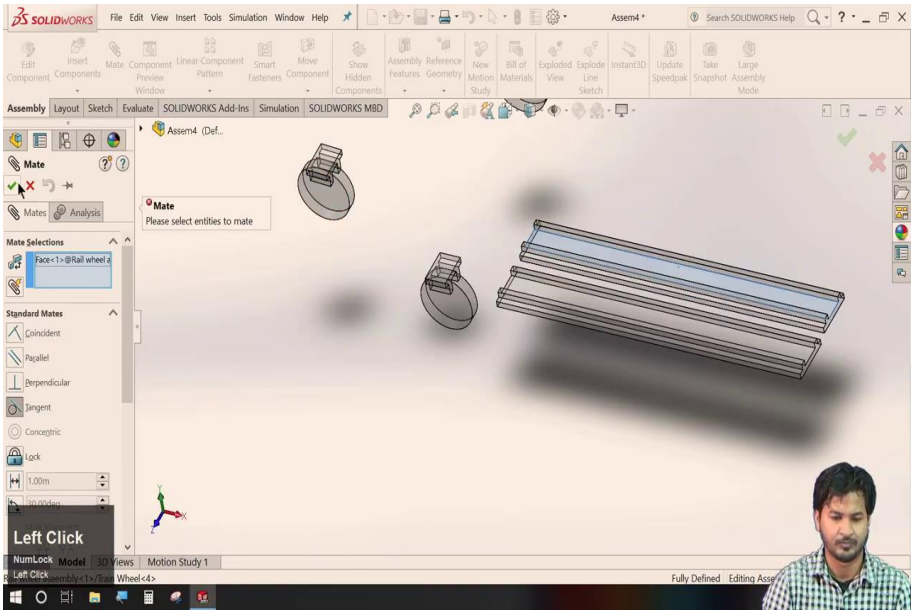


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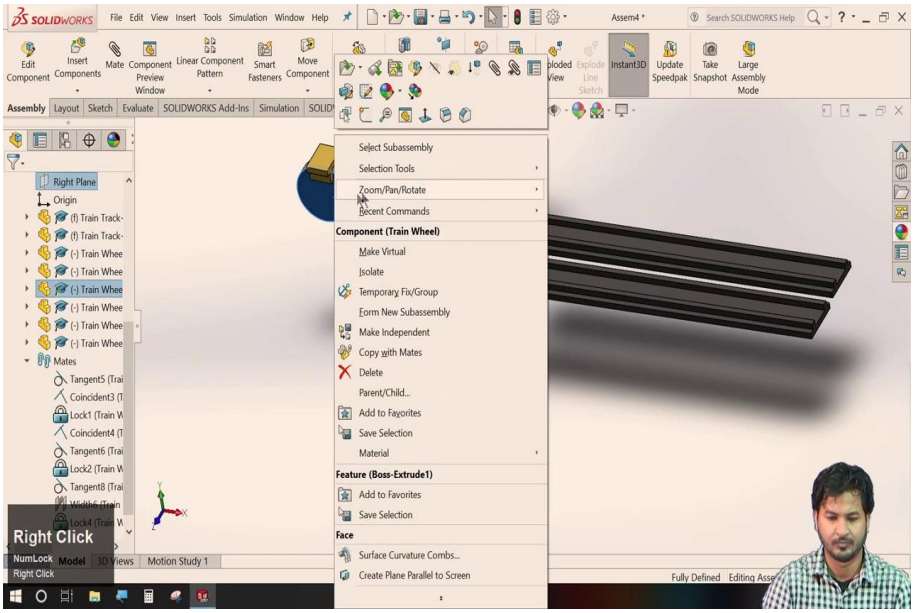

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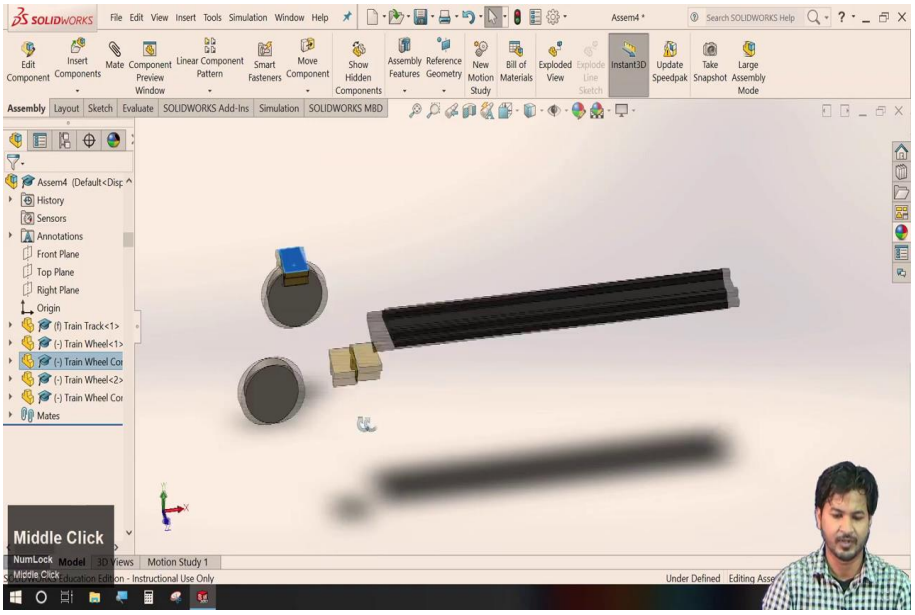


We will go to insert component select some of the parts. I here have some parts that are the wheel, a track and wheel top; we will just fix it, fix this top to this wheel. Let us just made it. I will make it tangent. Here, we have this track and this wheel. So, I need another wheel to demonstrate this linear coupler. I will do the same thing with this other wheel.

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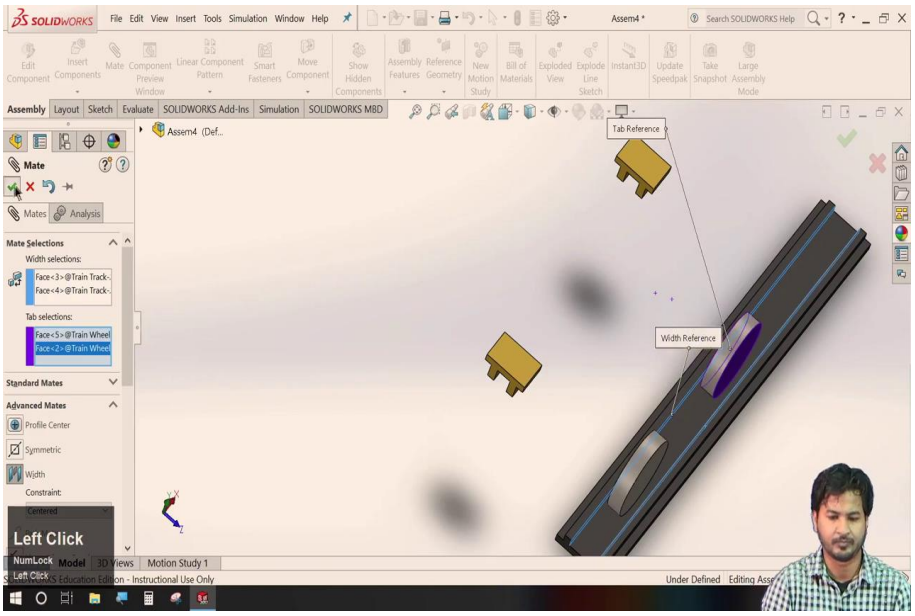


Now, here we have two wheels available. Let us just align these wheels to this rail track; I will make it mate.

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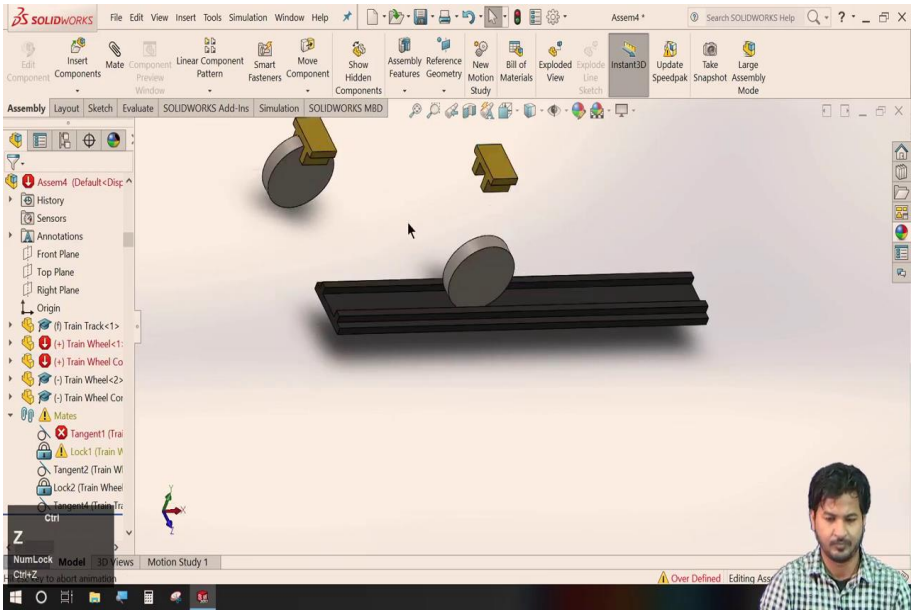

So, now, we go to insert components, we will load some of the parts over here. Here, we have a rail track, a wheel and a wheel holder.

So, we need two wheels to demonstrate in this linear coupler. We will make a copy. Let us just set up these wheels. I will align these wheels to this rail track once again to have this wheels in the middle of this track.

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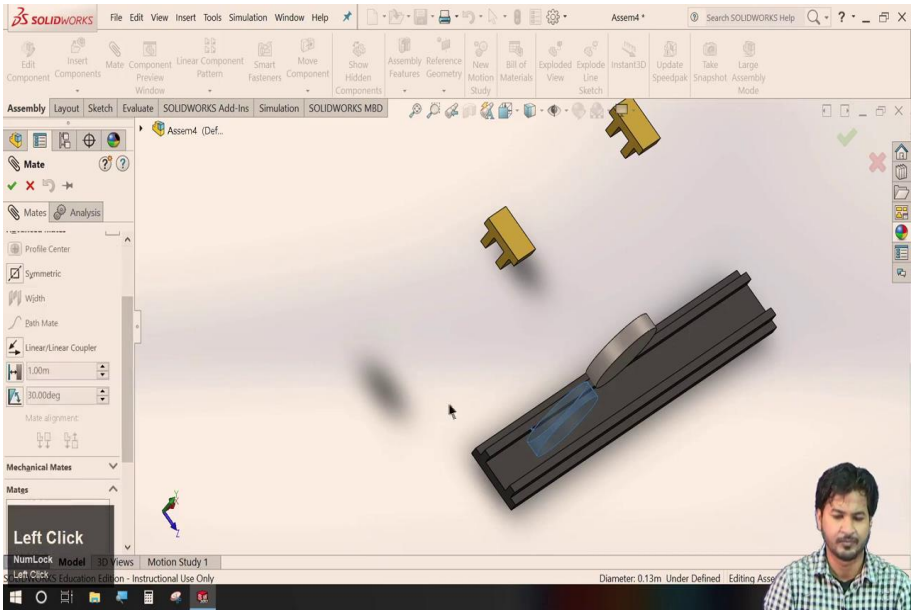

You can use width mate that is reference 1 and reference 2 and the item to be centred; we here have; similarly here. I will just put the heads over the wheels ok, we will go to.

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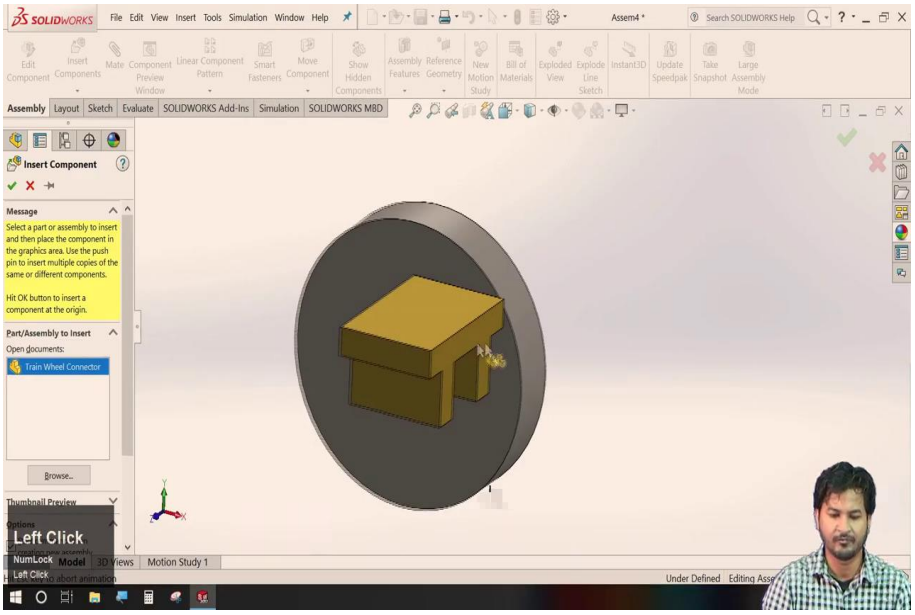


Now, we will go to this insert component. We will take a train track and wheel connector.

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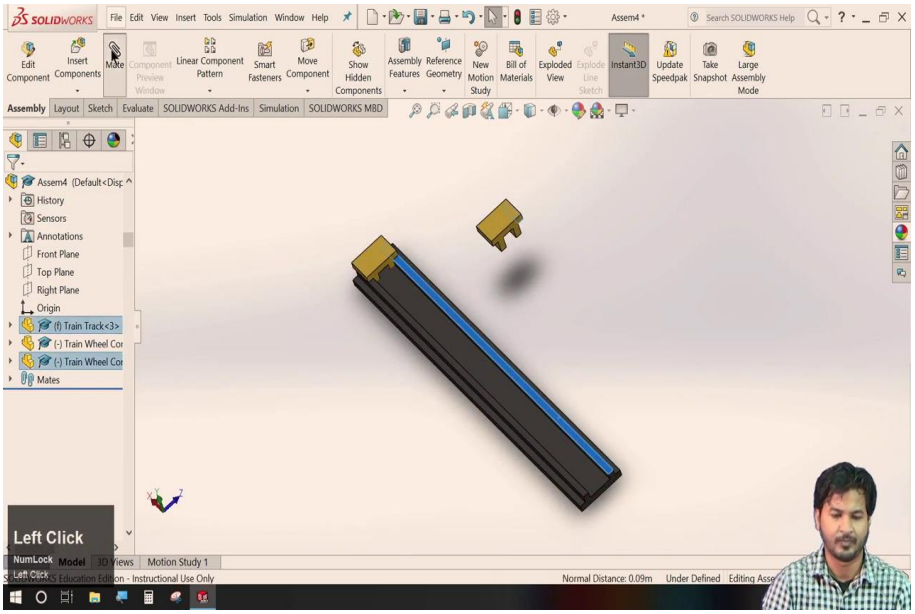


We here have two items. Let us just we need two different items to demonstrate this linear coupler. Align these two in the rail track.

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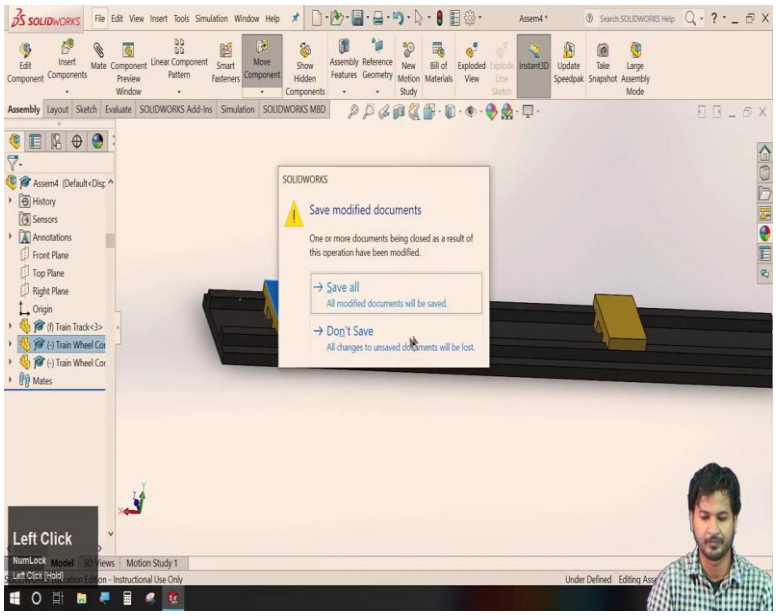


So, here we have this slider kind of thing. So, both of these are independent of each other. So, now, we will check this linear coupler.

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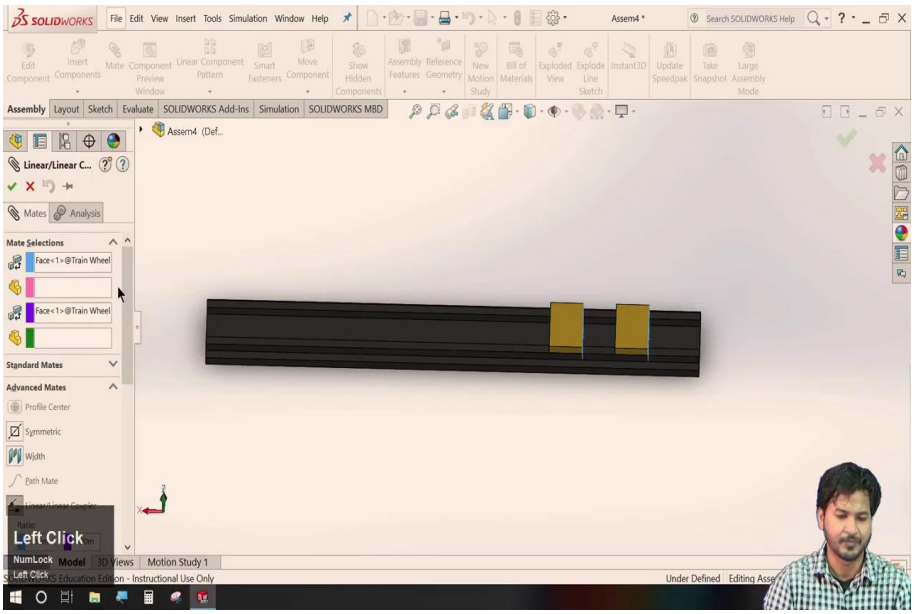


We will go to mate to advanced mate, then here we have linear coupler. This asks us to select two particular elements. Let us just select two this face and this face.

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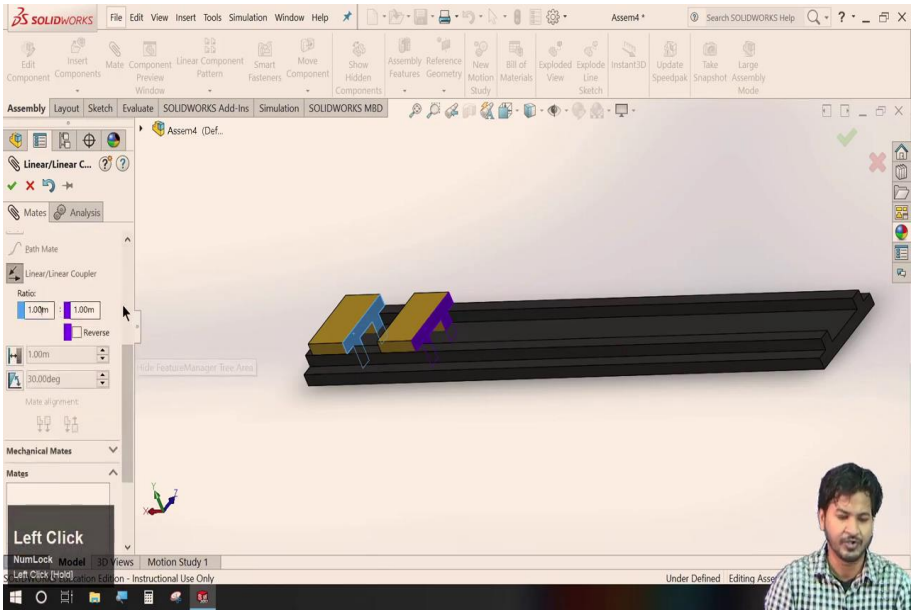


And we will sell set one ratio between these two.

Let us just select 1 and 1 to each other. We will click ok and as we move this item to in one direction, the other one automatically couples to that and move in the prescribed ratio. Let us just change the ratio and check that.

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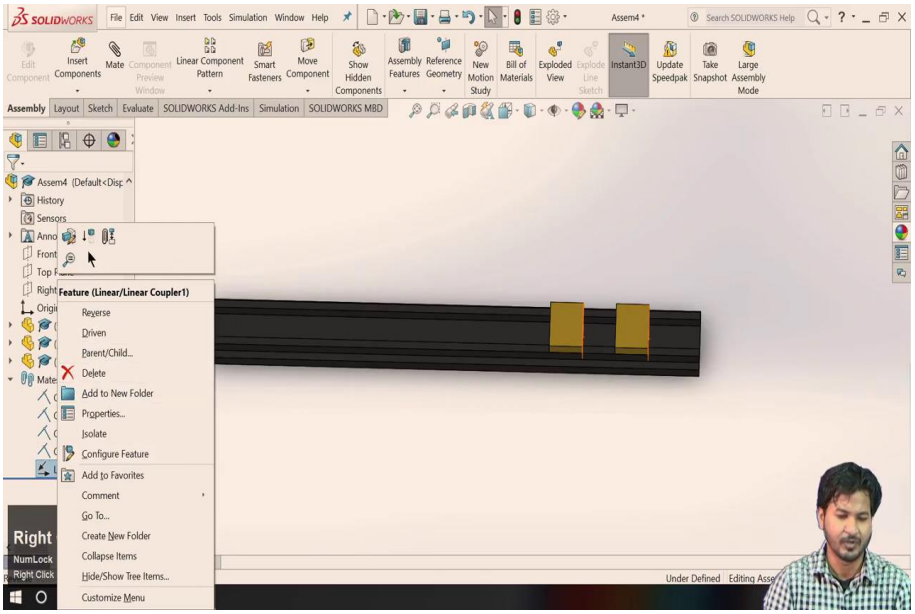


We will add the feature, I will make it say 1.5.

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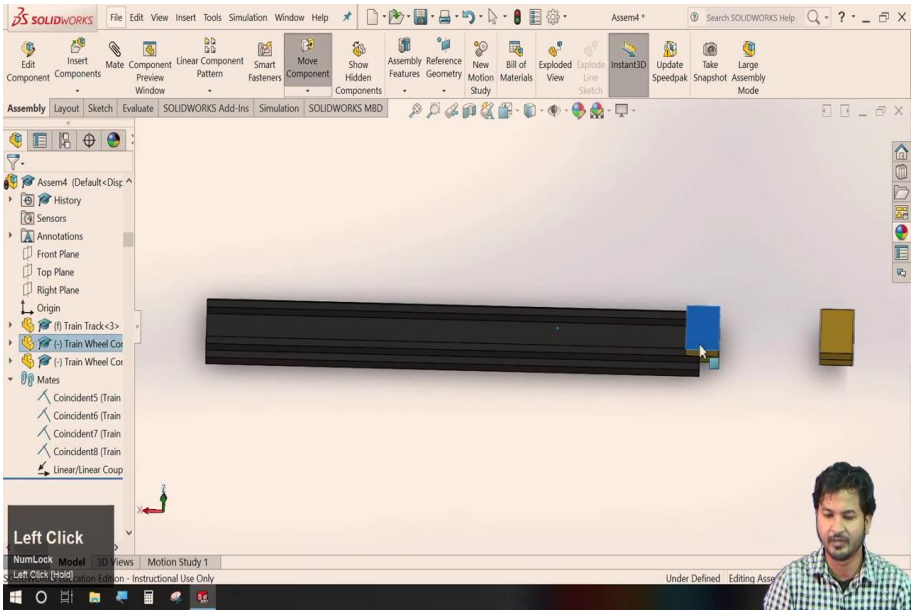


Now, you can see it the further the next one actuates and as in the ratio, 1 is to 1.5. So, this is a linear coupler. So, here we are finished this advanced mates.

In the next lecture, we will go about the rest of the mechanical mates that we have we have leftover. We all we have already have covered this screw mate and this hinge mate from mechanical.

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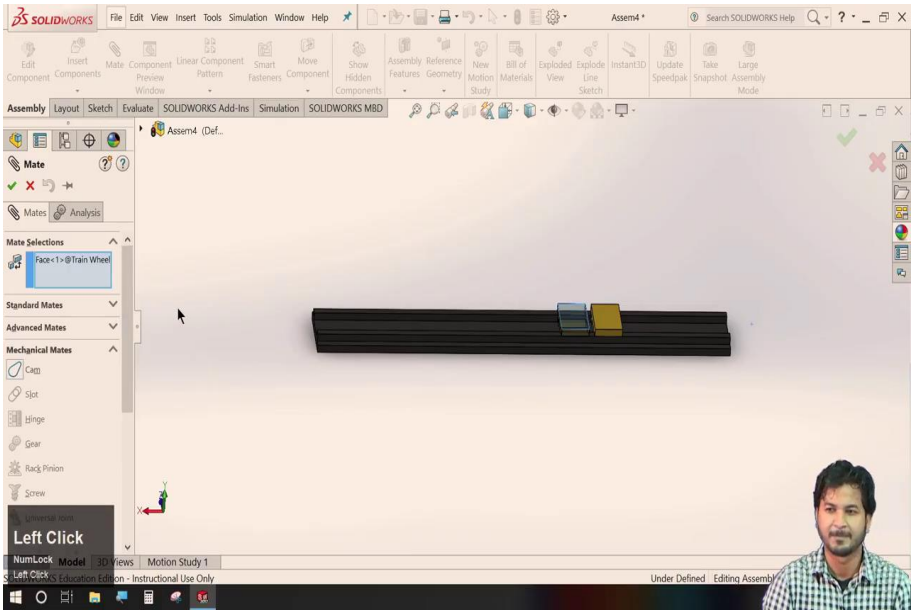


So, now, we have completed this advanced mates and in the next lecture, we will go about learning these mechanical mates that are cam, slot, hinge, gear, rack pinion, screw and we will we already have. So, now we have finished these advanced mates available in this solid works. We have

covered all of these, one by one; the profile centre, the symmetric width, path mate, linear coupler, distance limit and angle limits.

In the next lecture, we will learn about mechanical mates.

Thank you.