Engineering Drawing and Computer Graphics
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Lecture – 61
Assembly Drawing

Hello everyone. I am Gaurav Singh, I am a teaching assistant for this Engineering Drawing Course taken by Professor Rajaram Lakkaraju. I am here to resume this course, I will take on from the assembly of the parts we have designed in the software SolidWorks.

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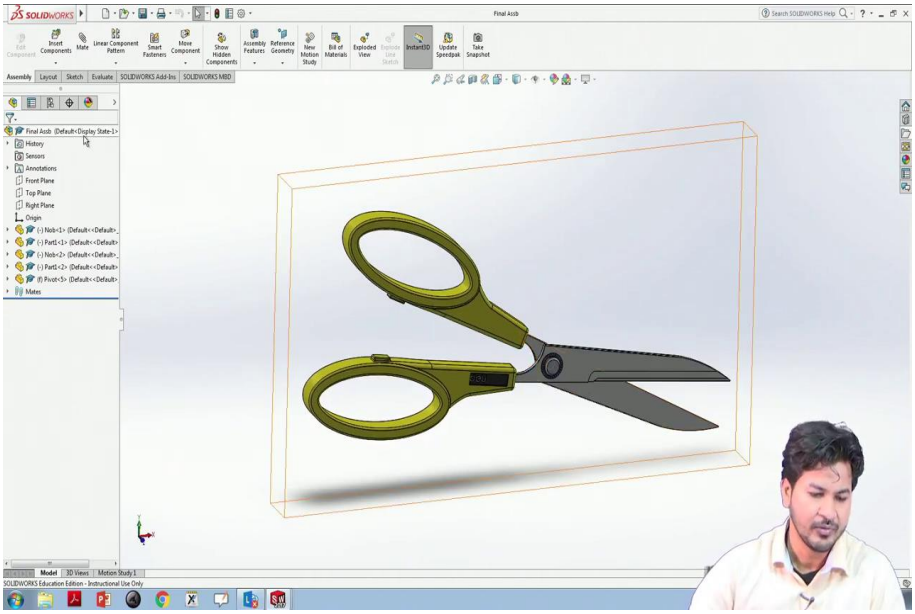

We have already seen it. You may have learned up till now regarding designing of the parts. So, now there is an important thing in engineering to assemble those parts to make one particular full design that may be used. One of such simple household item we can see is a scissor that I have that you can see on the screen is.

We can identify this scissor as blades, its handle, the pin, the pivot we say and so, there are particularly 5 parts we can see over here, that have been assembled to make this particular scissor.

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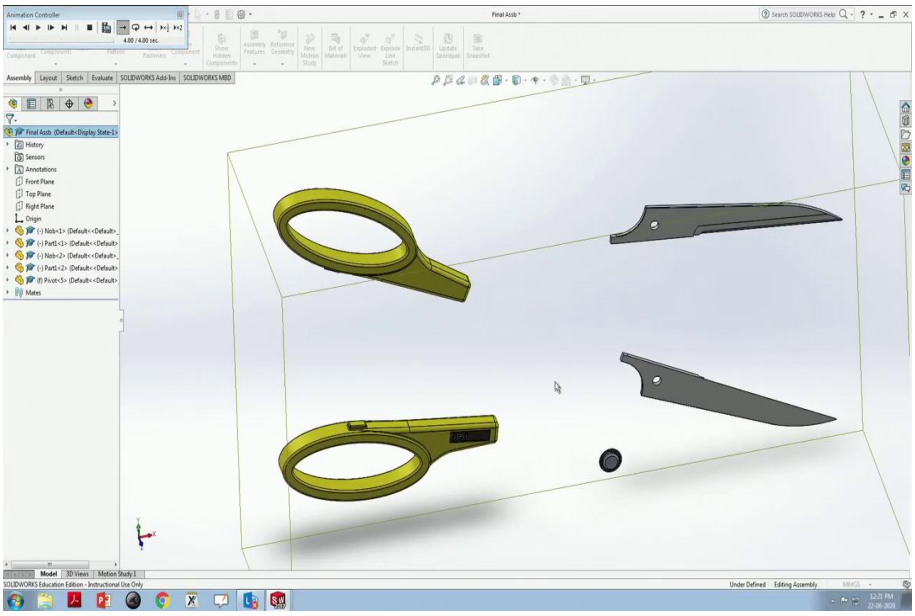

We can see these different parts here. Each of these parts you have we have learned to design in our previous course using these all kinds of tools the in the palettes in the Solidworks software.

So this is, using these particular parts we can assemble these to form one machinery any electronic component anything. So, one of this is scissors we can see. Another simple design.

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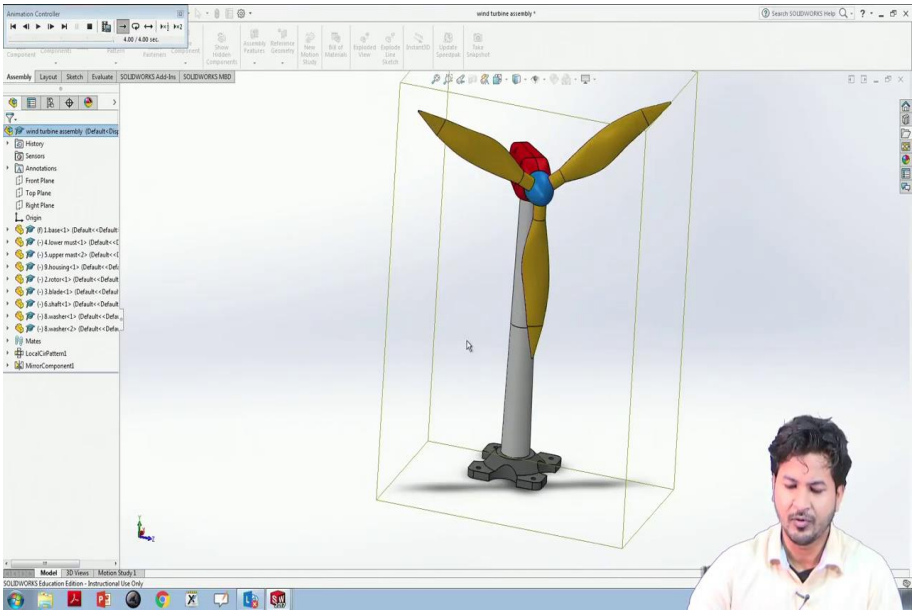

Another design we have is we can see it is a wind turbine, it is a very popular source of renewable energy. This device includes blades, turbines, motor, engine, this pedestal we can see.

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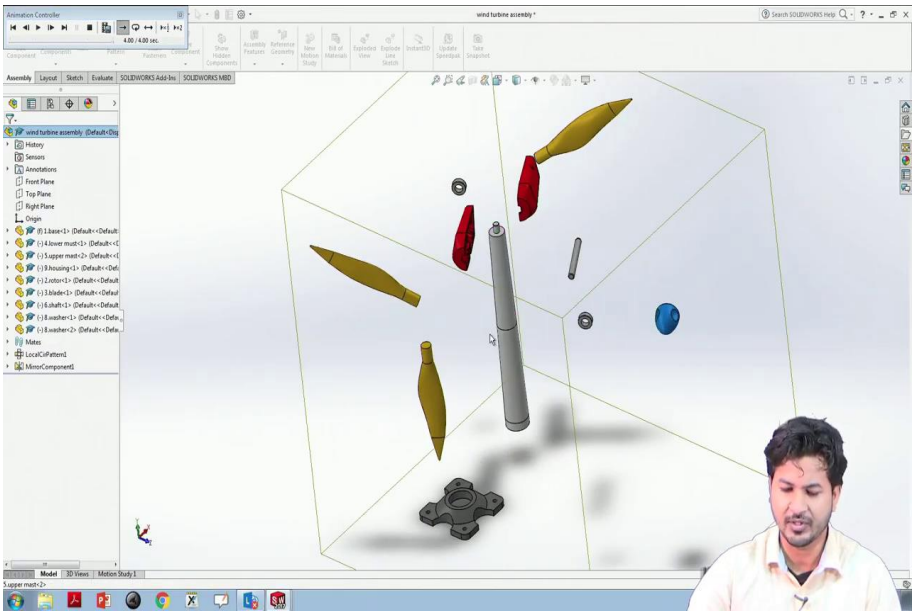

You can see this wind turbine is made of these blades. We can see the individual components of this that are designed on this software itself and we can see and we can see the assembly of this to form the wind turbine.

A good feature of this software solid mechanics solid works; good feature of this solid works is this actually works on it actually works as it simulates the mechanics of solids you can see the blades.

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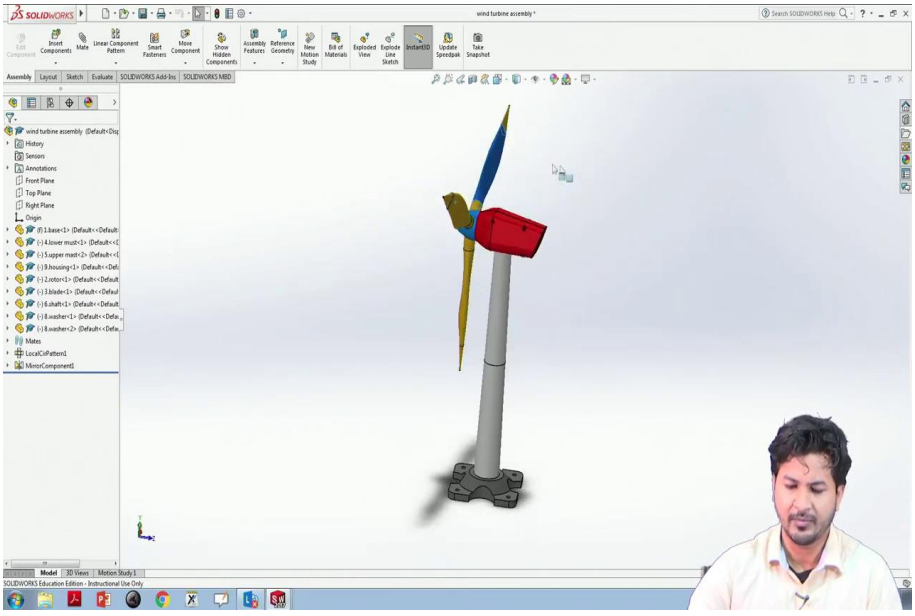

You can see the blades can rotate along the wind direction, the whole the setup and also the motor may run as the wind will strike the blades. So, this is one design.

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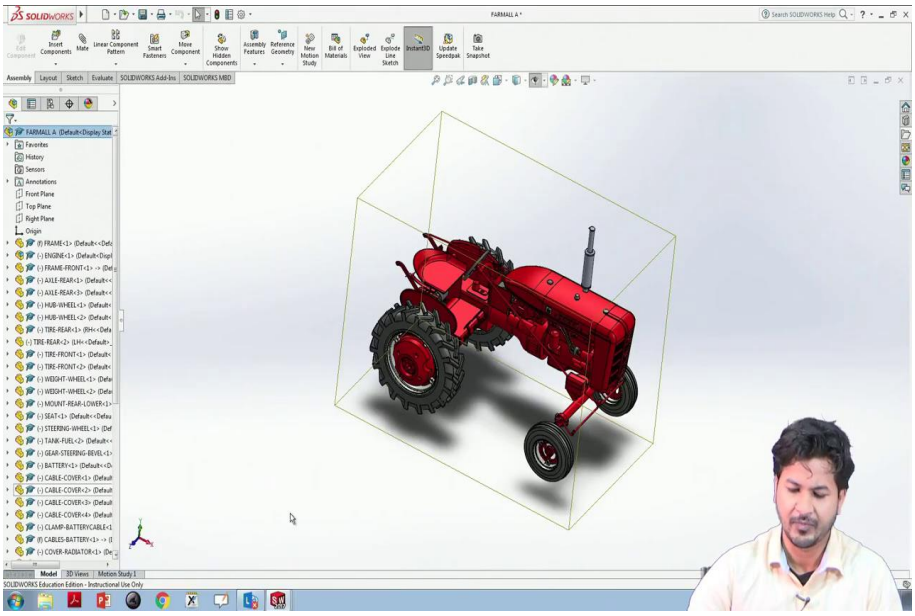

Solidworks also supports the assembly of far more complicated items like to build this tractor we can see. This build of multiple components that have been accumulated to form this beautiful tractor.

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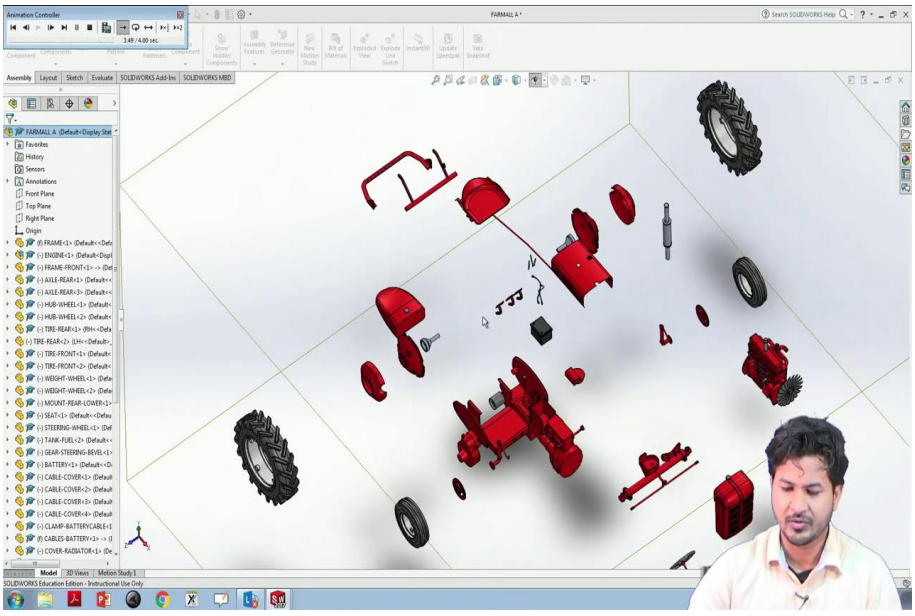

We can see these parts of this the larger tires, the smaller tire, the engines, the smoke exhaust and all those things. This is been very beautifully assembled to form this one tractor. All these assemblies include some very elementary assembly terminologies that we will go through one by one. The assembly in this in SolidWorks is synonymous to mate here; mate option you can see.

So, in the assembly section, we will learn from elementary to how to insert components and learn all of these tools that we have we can see over here. So, let us begin from the start. So now, from now earlier we have been using this new command to open a new document.

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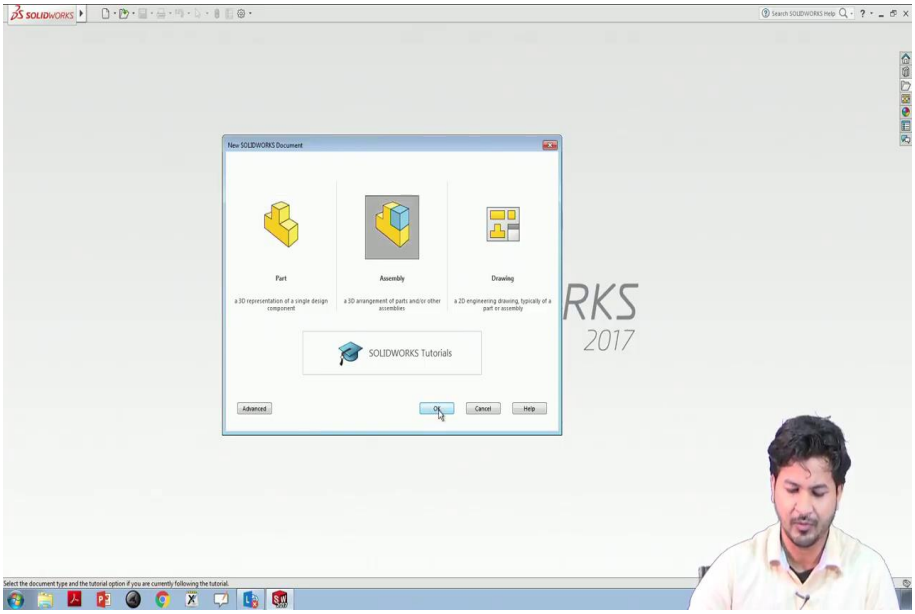

We have been working on this part section. Now when we are going through this assembly we have to click on this assembly and ok.

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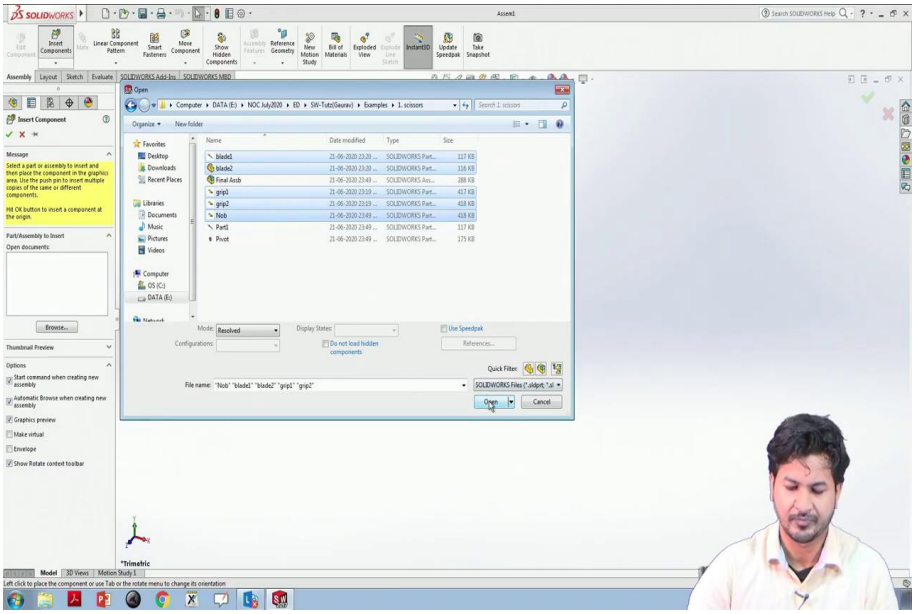

This assembly thing, the window looks like this. To assemble multiple components we have to insert the components we can see here, then going through browse it will open.

So, let us assemble little how-to insert things we will check these some examples. So say this scissor, we will control select multiple things and click on open.

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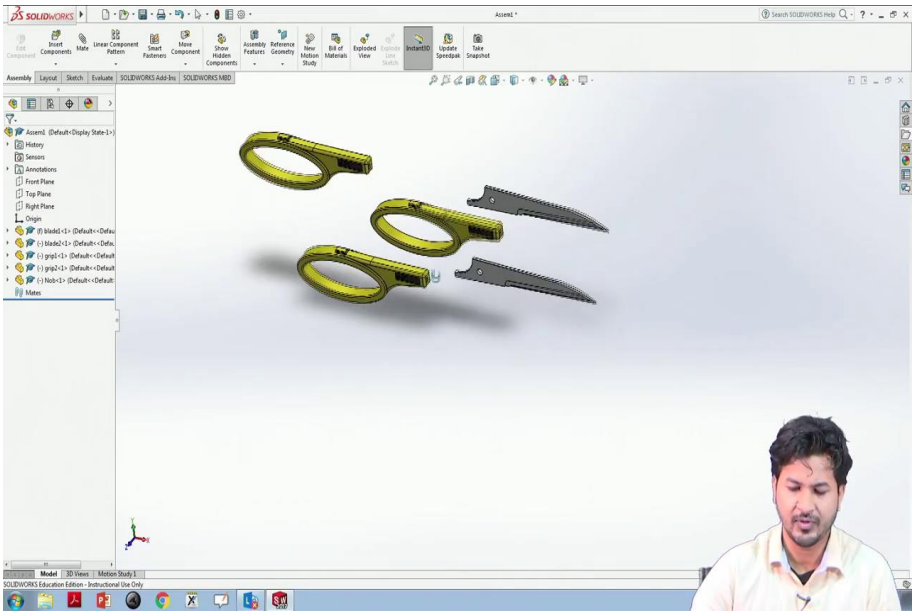

In SolidWorks the first part we can see. So, in this way we can. Up till now, we have discussed the new document, we were we have been working on this part. So, now we will be working on this assembly we click on assembly, we click on assembly click ok.

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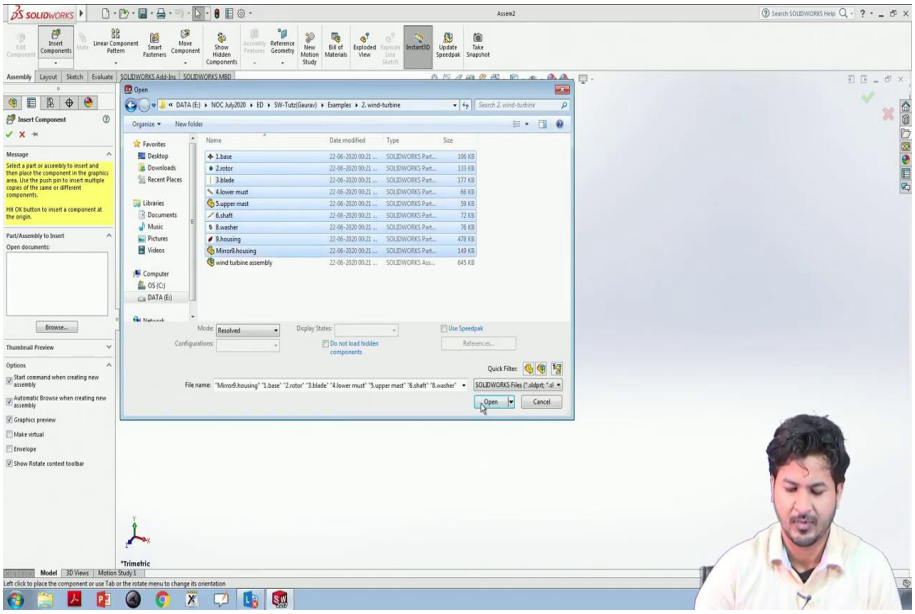

So, this window will ask to us open some parts, this is the windowed look like for this assembly window. We will go on we have to go on this insert component then go to browse, we have to select the parts we have been we will control select all the parts and click open.

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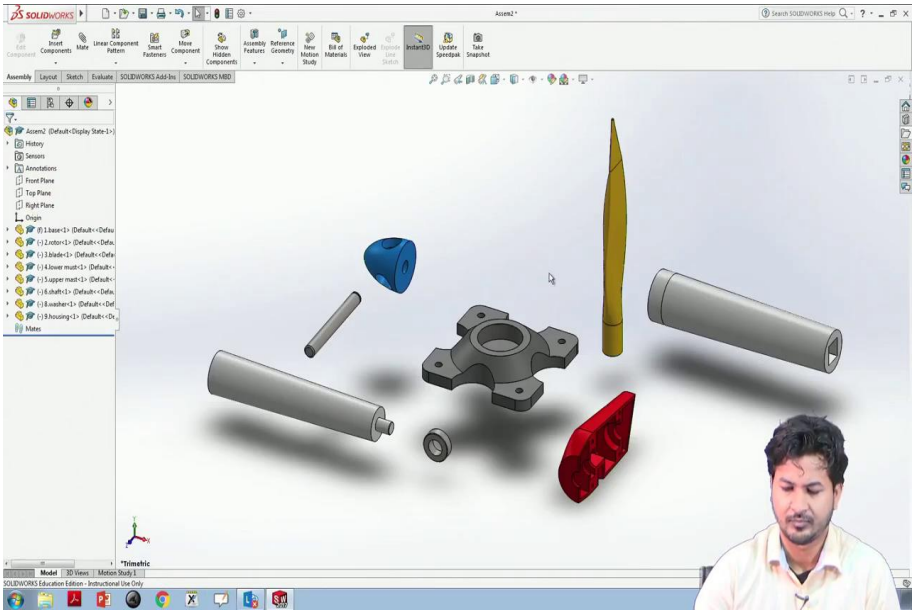

So, these are the parts that were required to build that wind turbine that we have seen earlier. So, in this way, we can insert components in this window. The important thing to note is the first component that we have been placed, we have seen placed in the window this will remain fixed and it cannot move anywhere.

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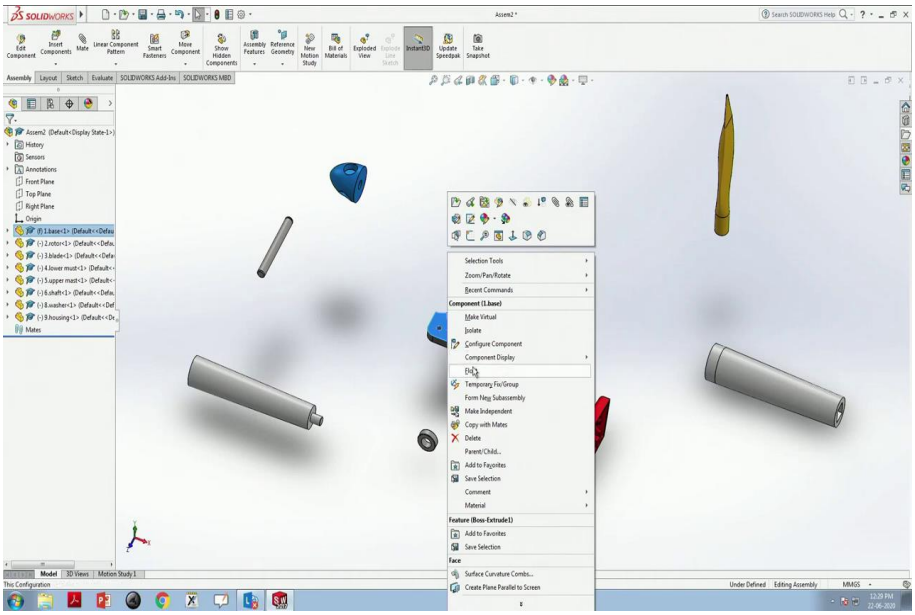

However, the other parts can be moved. You can see it. To keep it to make this move we have to right-click this the object, we earned we can click on the float. So, this will be floating now from now. You can fix anyone else to make a reference. This is fixed now and all these are moving. So, in this way, we can make something floating and fixed some items.

So, there are some tools to see this visibility icon, we can see the origin of this, the origin of each of the items, we can see the origin of each item. We can see planes from here. We can see planes say supposed for this we have to go on this hide and show items click on planes, we can see the front plane right plane. This is the basic way to import these parts that we have designed earlier.

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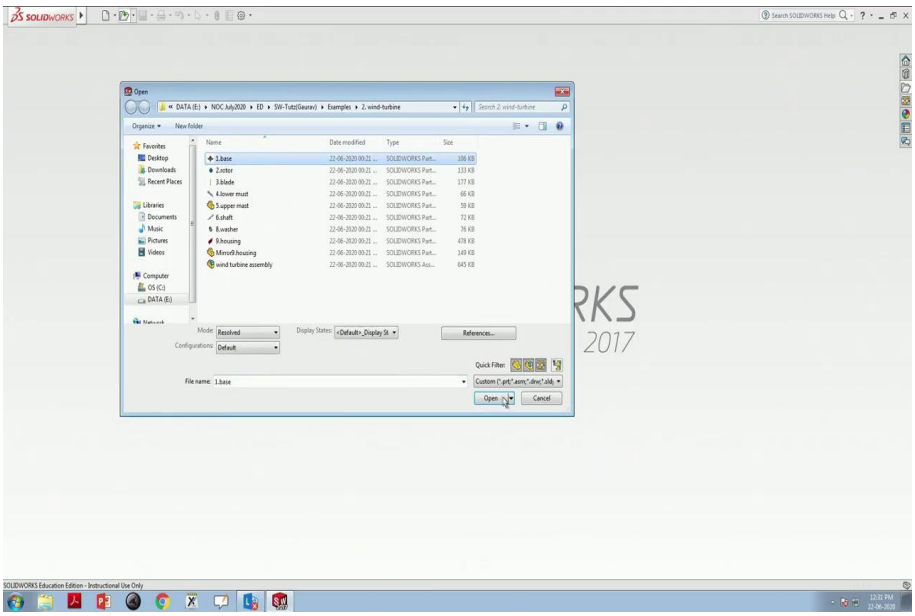

Another way like suppose we were designing one of the parts like we have done earlier. This the earlier window you are familiar with this part window.

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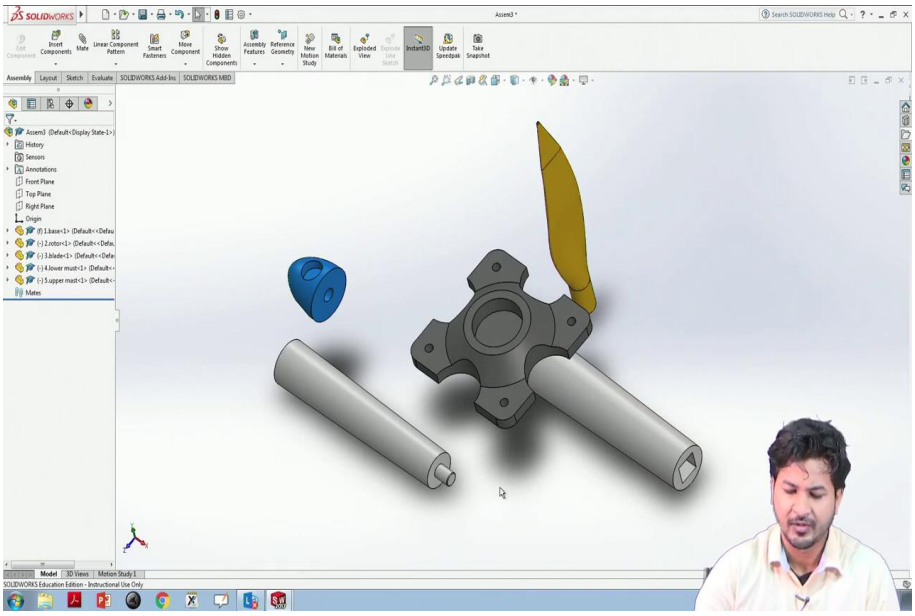

So, now, you have designed this part and you have other parts already ready. To use this in assembly you have to go to this file go to make assembly from the part. So, the same last window that we are we were discussing can be seen here. You can import it like this, and then again insert the component in browse and other items that we intend to include.

Now, to assemble each of these items into one another, we need to know different kinds of assembly that are available in the SolidWorks. And we can see I have already told you this assembly is synonymous to mate in the software. We can see if we click on mate, we can see different kinds of mates here standard mates, advanced mates, mechanical mates.

So, in standard mates, there is coincident parallel perpendicular tangent concentric and so on. And higher advanced mates, hinge, gear, rack pinion, there are many more. So, there one, we will go through each of them some, we will go through some elementary mates of them out of these, one by one.

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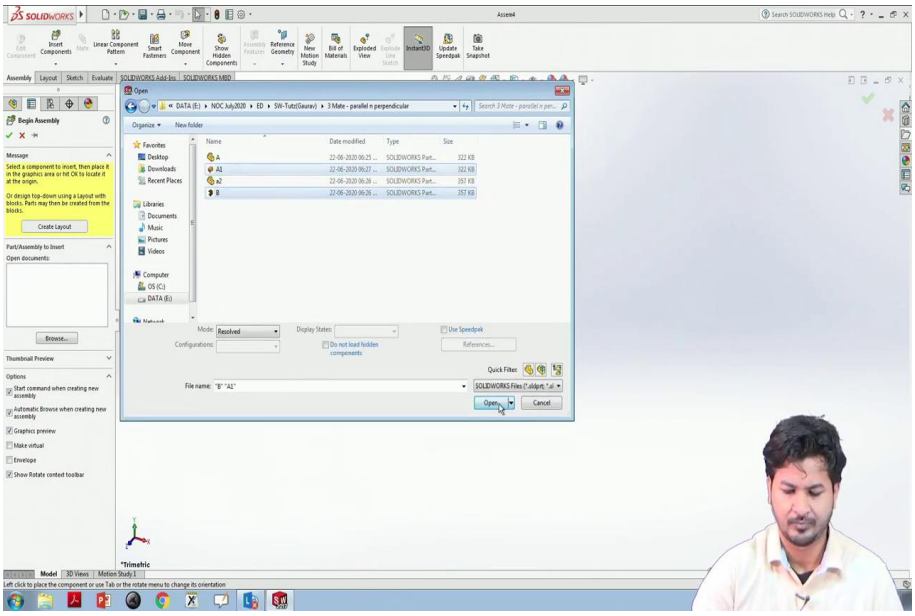

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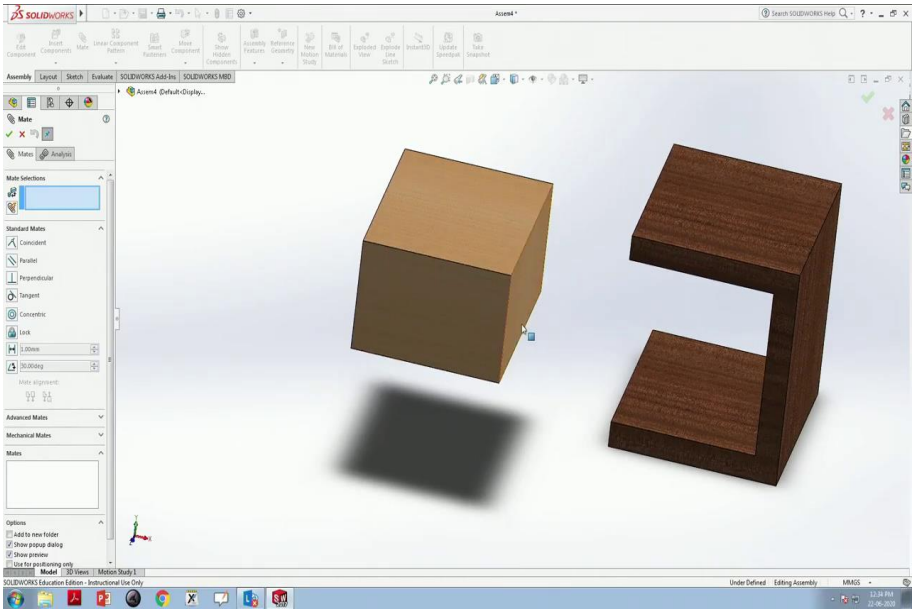

Let us open a new document, a new assembly. I have two blocks here, two wooden blocks we can see here. Now, if we want to mate this puzzle, we can go through mate. We will see here this mate selection has a window, the small window we have to click on that and select the faces we want to do we want to mate.

So, for one of the first of these is this coincident mate. In coincident mate, the two things that we want to assemble or mate will coincide.

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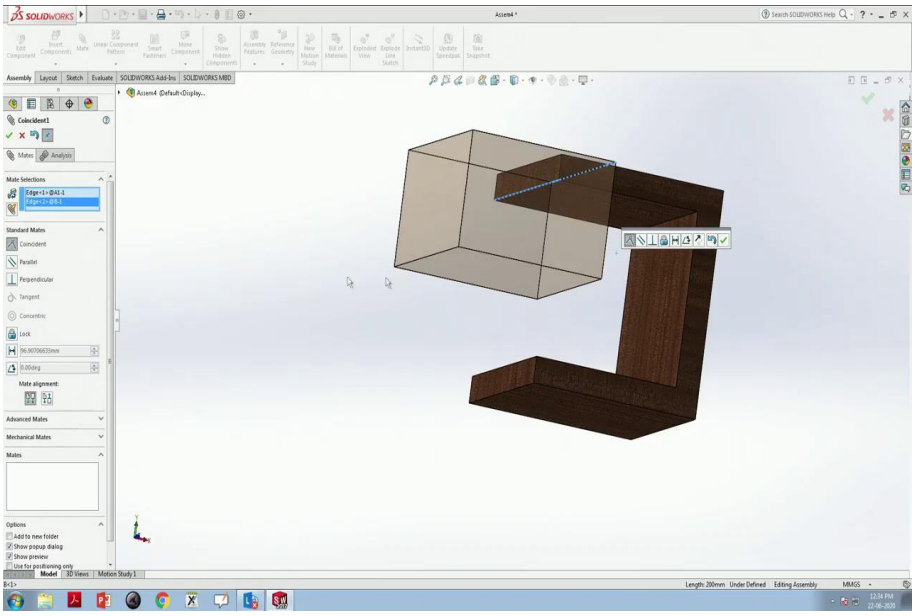

Suppose we want to we want this edge to stick on this particular edge. So, you can see the preview here This is aligned with this edge and once we click ok, this is mated with this.

So, this is aligned with this edge. However, because of a loose degree of motion degree of freedom, this can move and can rotate as well. However, the alignment is all same.

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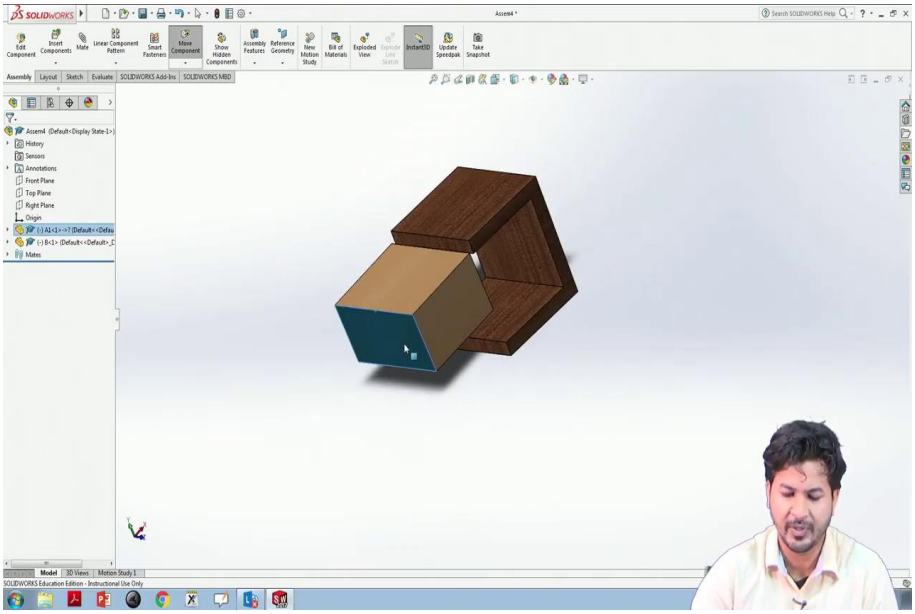

As we have, as I have already told you this part cannot be moved because on the first, the first item that I brought here was this block and this is fixed to make this float I can make this float.

So, now both of them can be moved. But to make a reference we need one of the items to be fixed. So, now, we can fix this one right-click on this, fixed. So, now, this is moving and this is fixed. So, this was a coincidental mate. Another thing, another important feature that we generally use this coincidental mate is to fix the origins.

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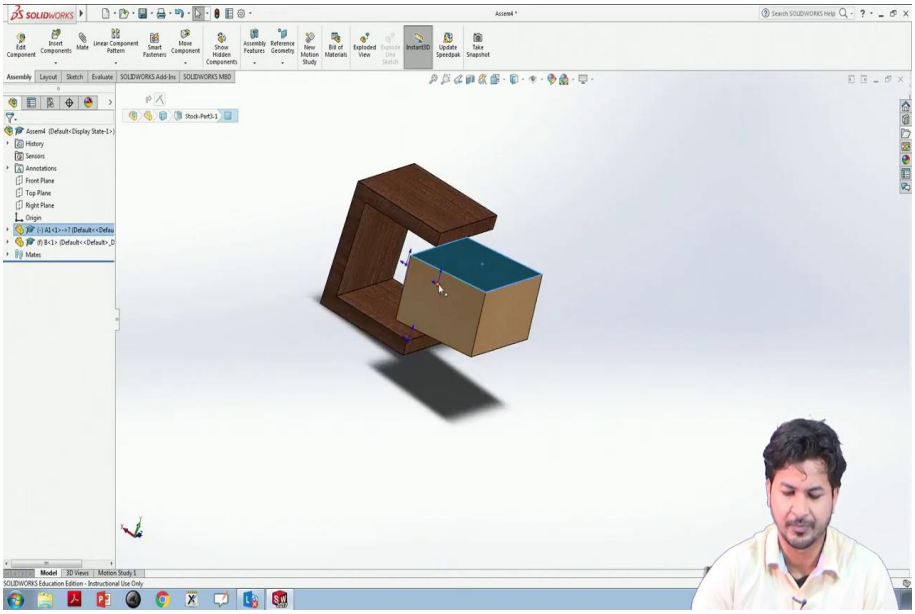

Suppose this particular block has its origin we can see this origin over here. However, the origin of this geometry, the origin of this whole play this whole window is here. So, if we want this assembly to start with the origin, we can select mate, the origin of this item and the origin of this item and this mates here, and click ok.

So, it is not mated because this item is fixed and we have already aligned this edge with the edge of this.

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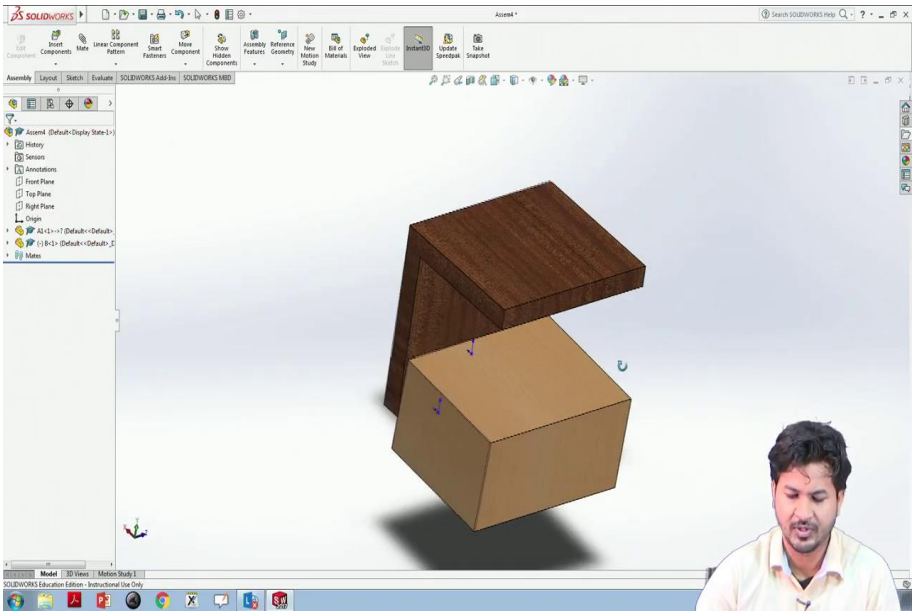

So, if we make this float, now we can see the origin of the whole plane is aligned with this origin of this box. And now because this is now floating, and this is fixed now because it has to be attached with the origin of the plane. This was coincidental mate.

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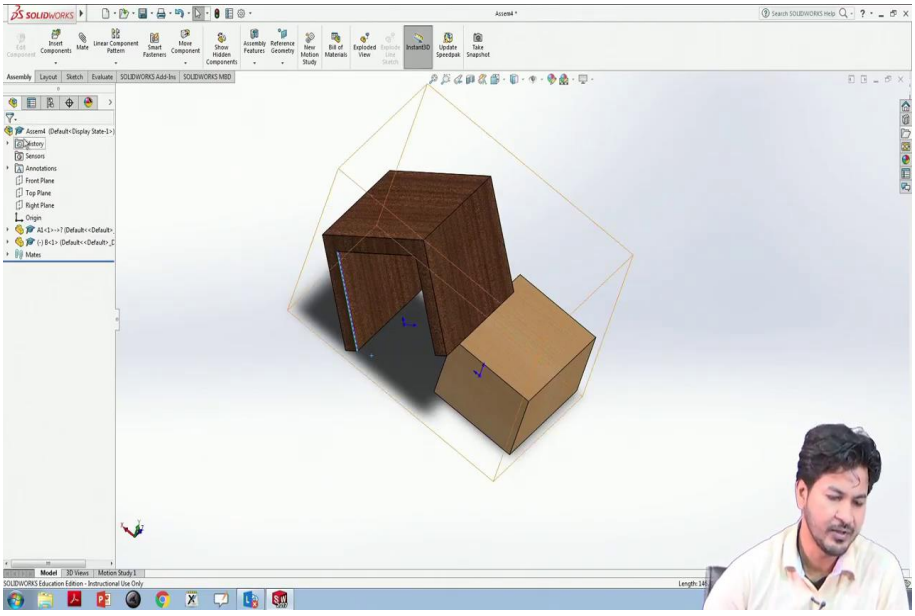

The mate history in this assembly we can see here mates, what we have done is this the first coincidental mate that was between the edge of the two blocks and the second one thus mating of the origin of this block and the plane coordinate. So, this was coincident mate we can see here. Another thing is the parallel mate. Let us remove all these earlier ones.

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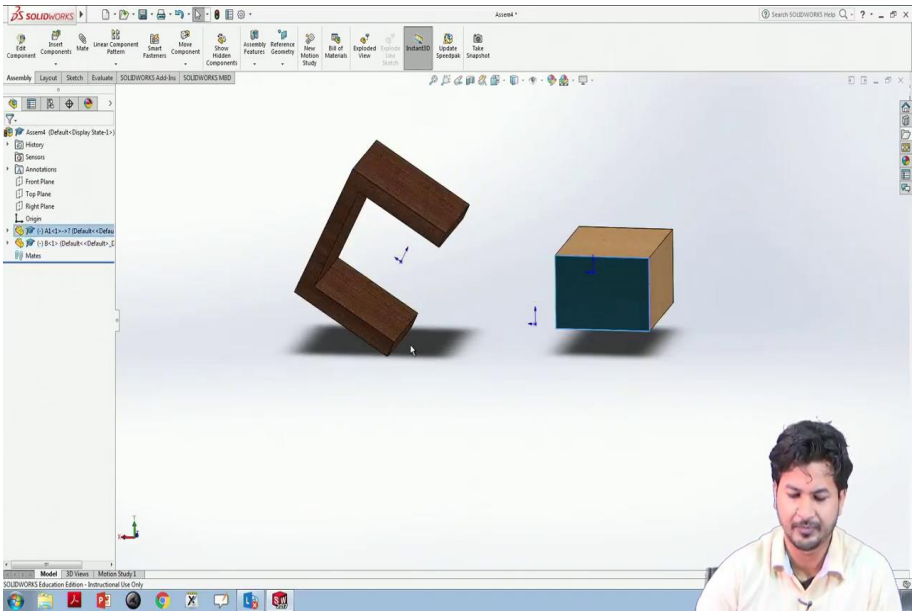

Now at again both of these are free. We will fix this. The next kind of mate is parallel mate. In this mate, we can make two planes a parallel to each other.

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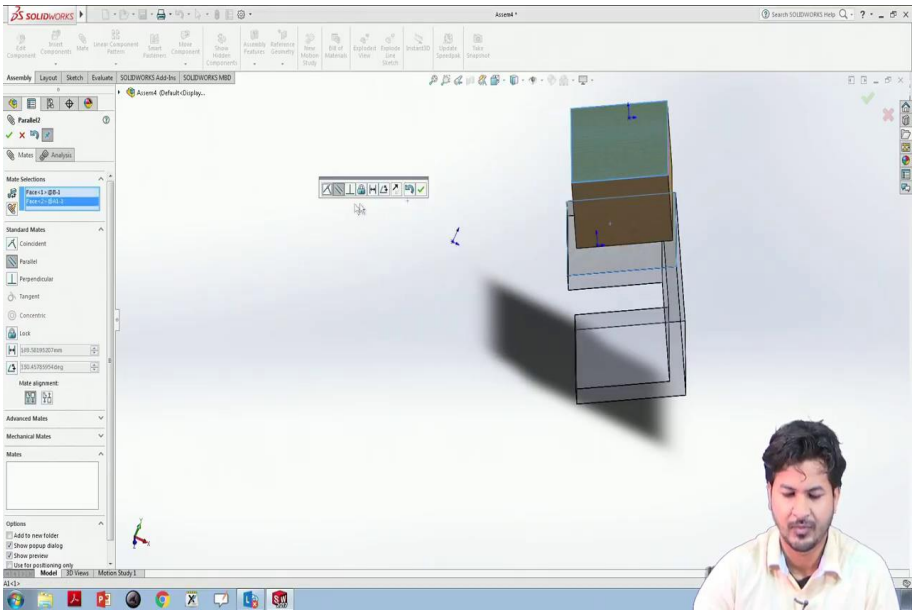

As of now, we can see these two are not aligned parallel to each other. To make this parallel we will click on the small window here, then the phase 1 and then the phase 2, we click on ok, finish mate.

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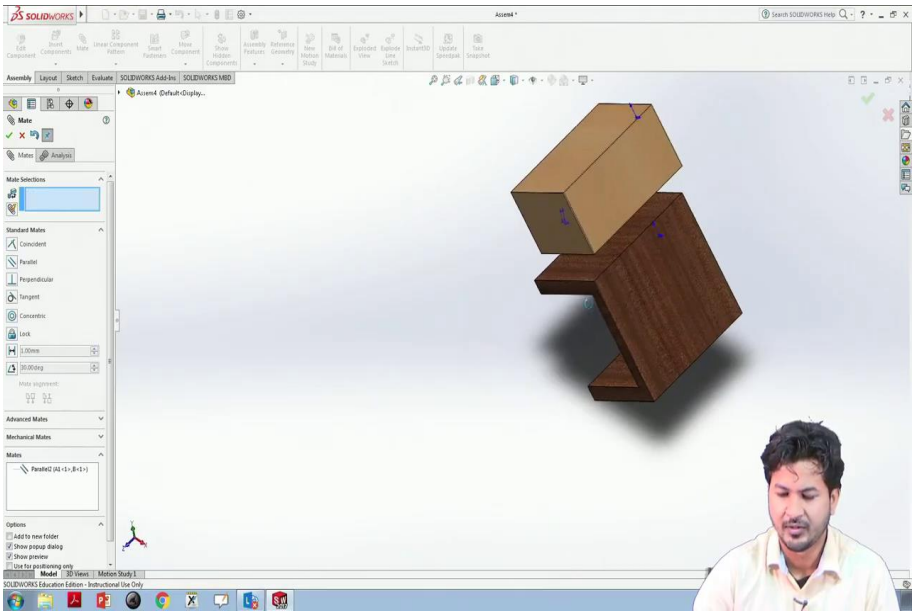

The two phases are parallel to each other, this phrase and the top one of this, they will always remain parallel to each other.

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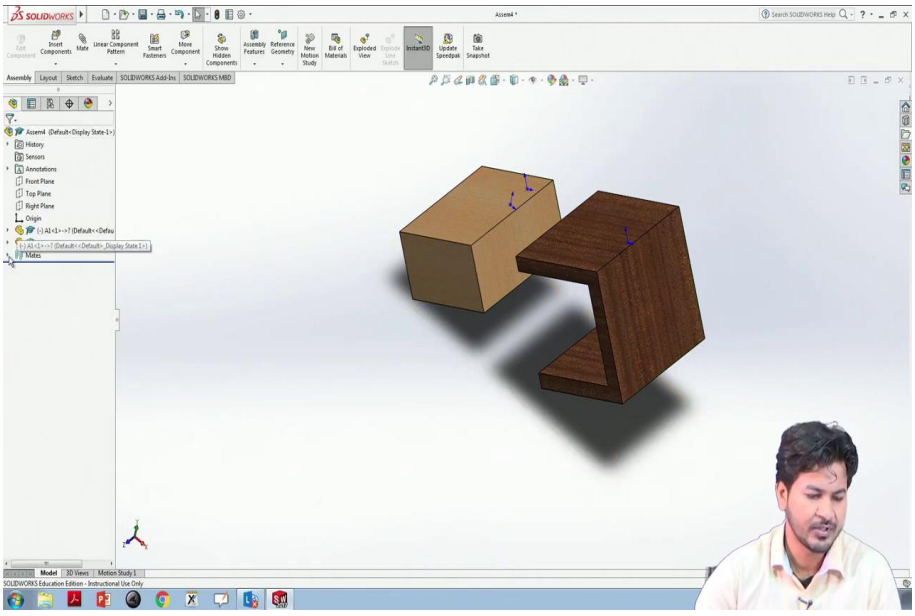

We can see it again. This is the mating history if we remove this, once again mate we will select on this one.

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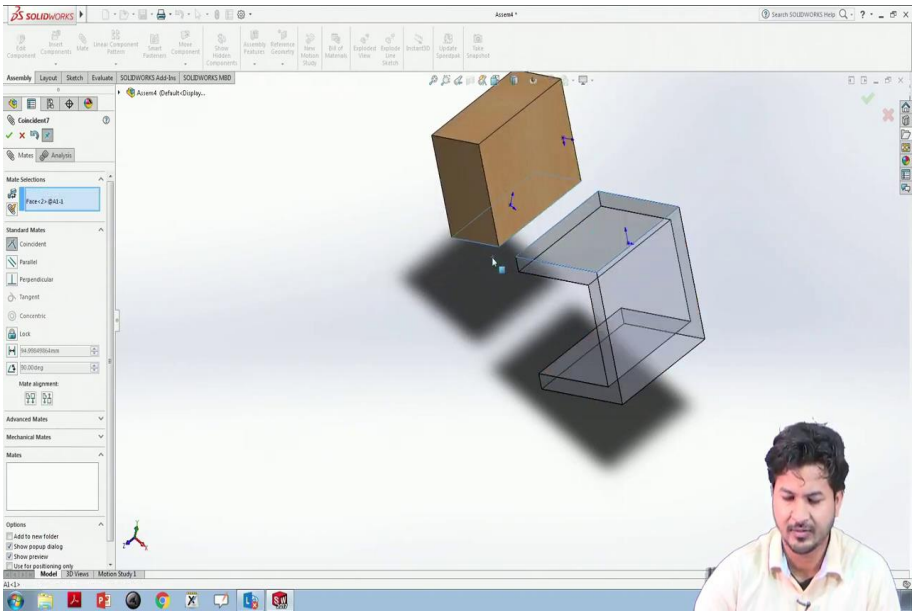

Now, let us select this plane, and this face now this has become parallel to each other.

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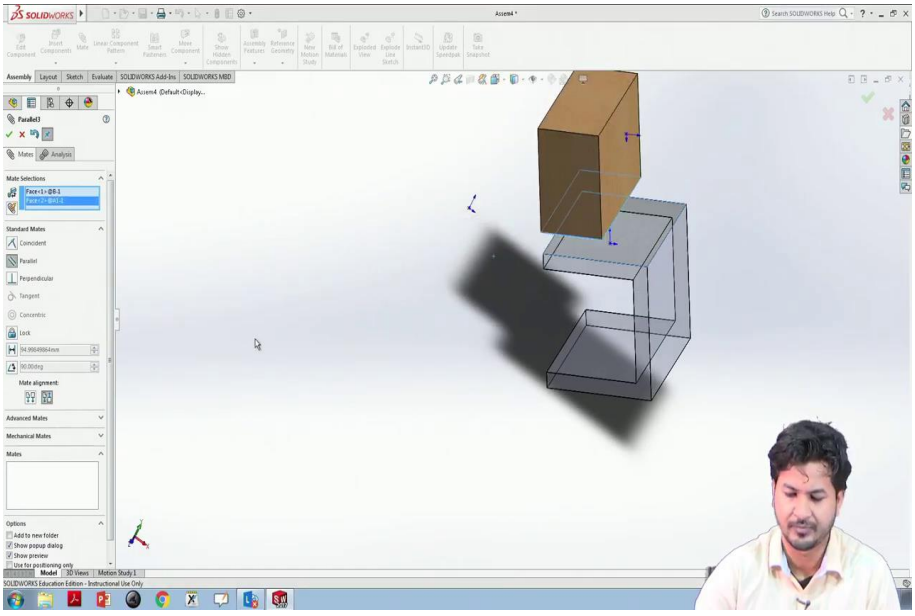

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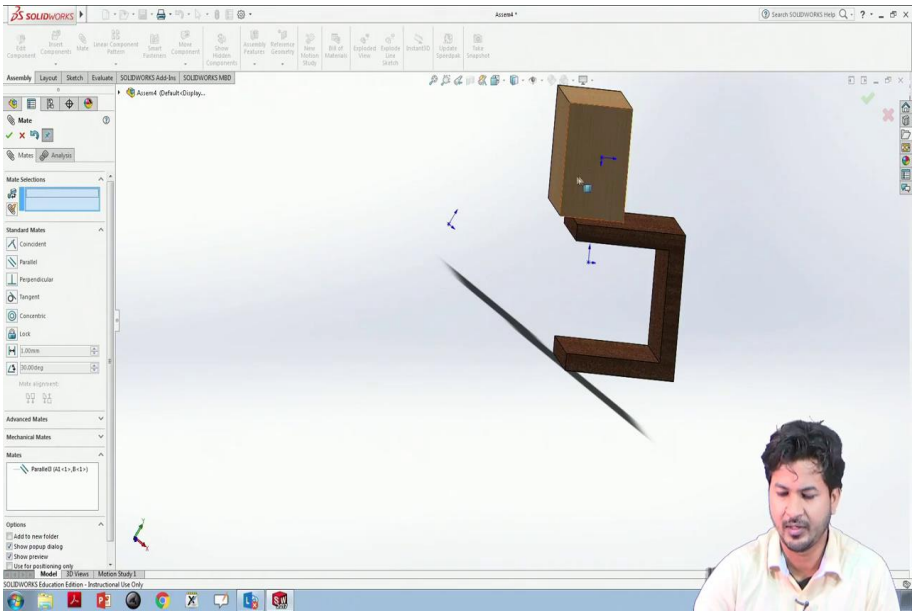

Let us click on parallel. This is parallel to each other. Anywhere it moves, it will remain parallel.

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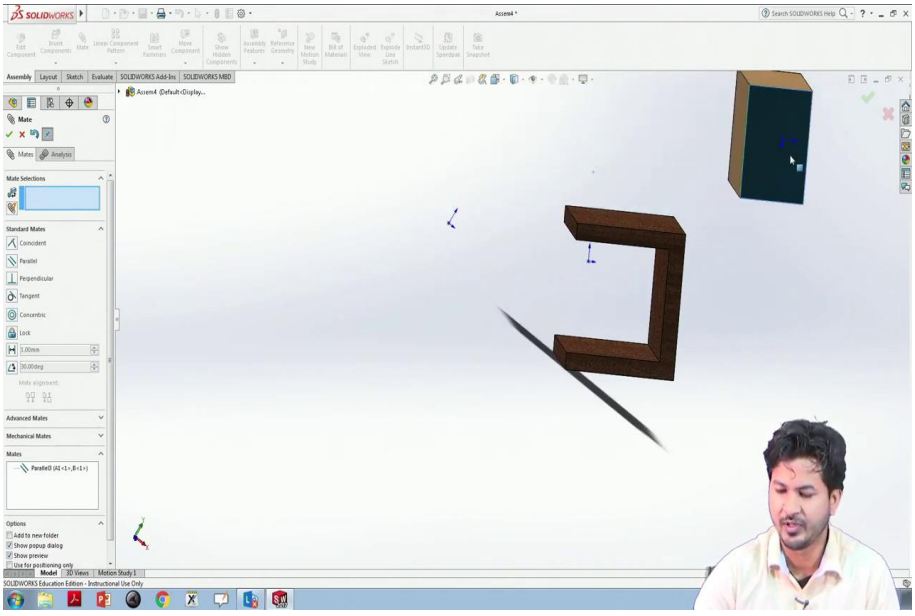

The next kind of mate is perpendicular mate. This is very similar to this parallel mate. Let us delete the earlier one.

We will remove this parallel mate and we will move on to perpendicular mate. Again click on this small window, we will see this face let us make it perpendicular to this one or say this one, click on ok.

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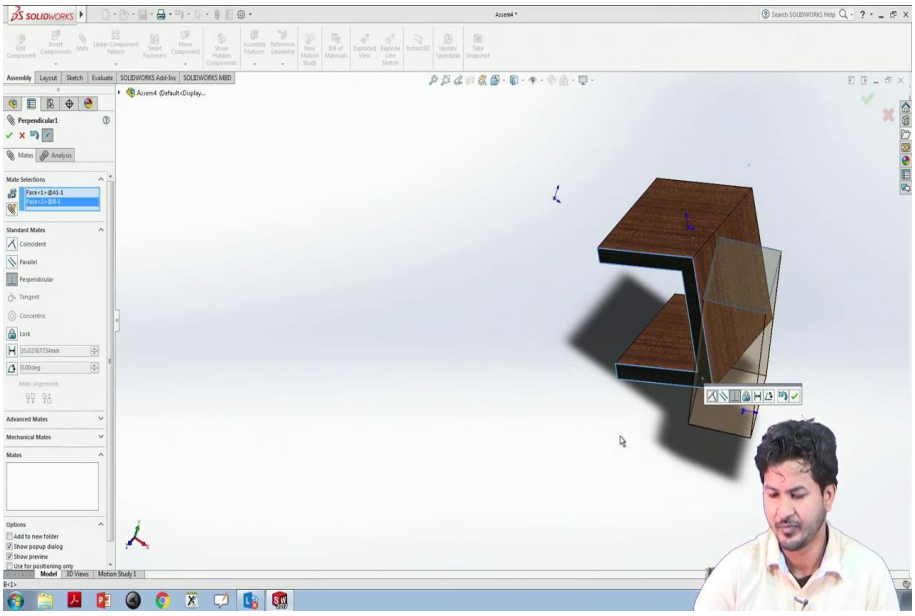

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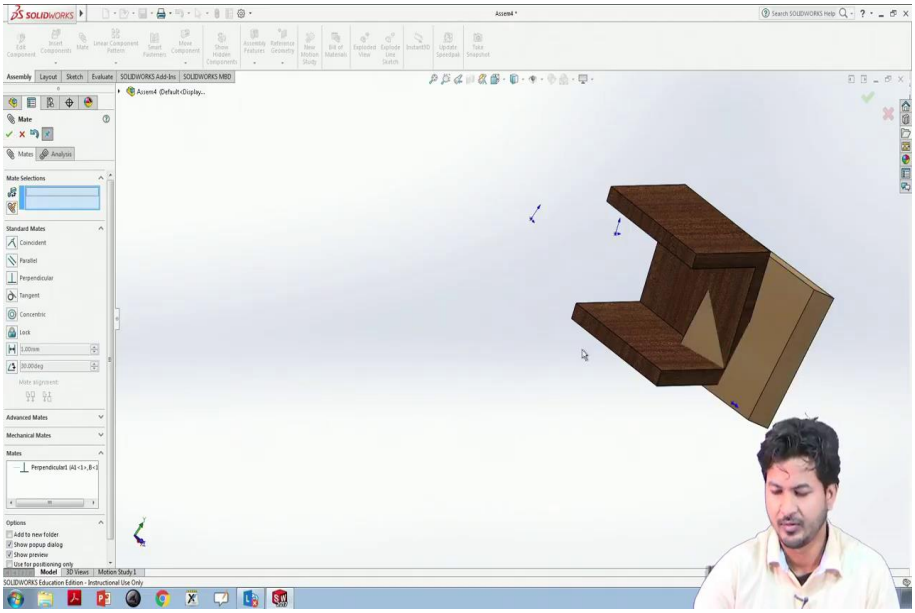

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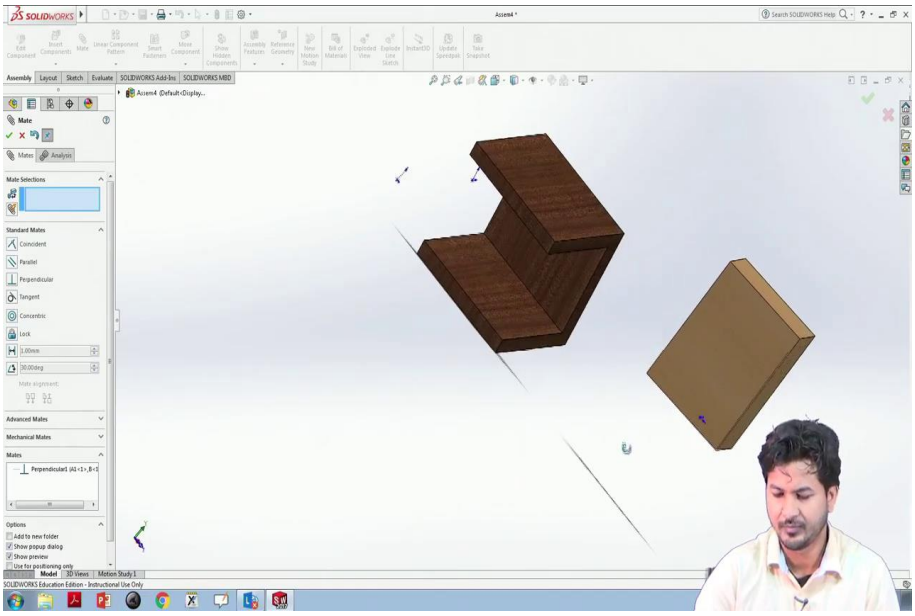

So, now, this face is always perpendicular to this face. Anyway anywhere it moves, but it remains perpendicular to these two. Next kind of mate is tangent. We will have to deal with circles, when we are dealing with this tangent may kind of mate.

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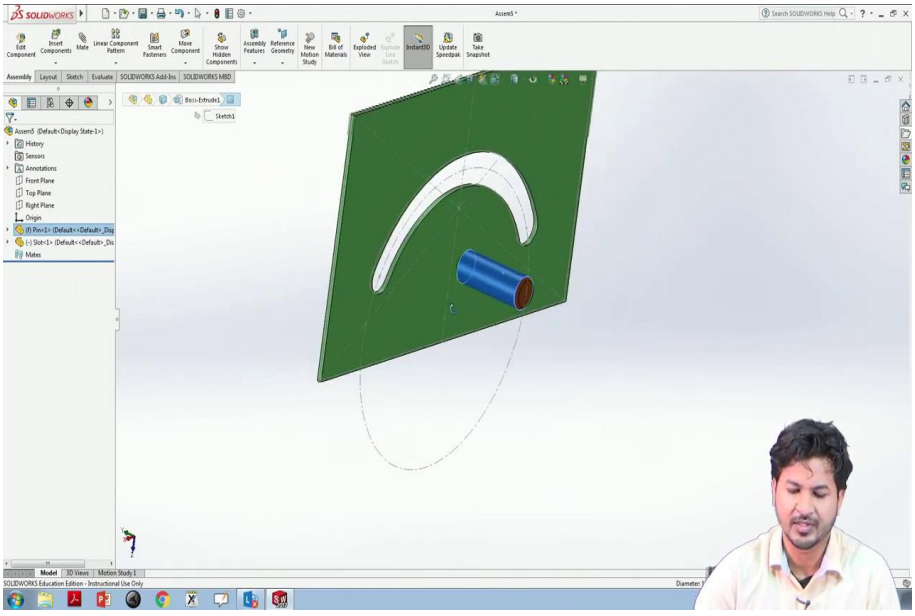

Let us load some new geometry to understand this tangent mate. We have a pin and we have a slot. Generally, we can see such kind of things in meters, the odometers and all these things or knobs that required setting of temperatures and other parameters. So, what we intend is this pin is supposed to move through this lot, and from a general intuition we can we wish that this particular surface is supposed to be tangent on this circular cylinder.

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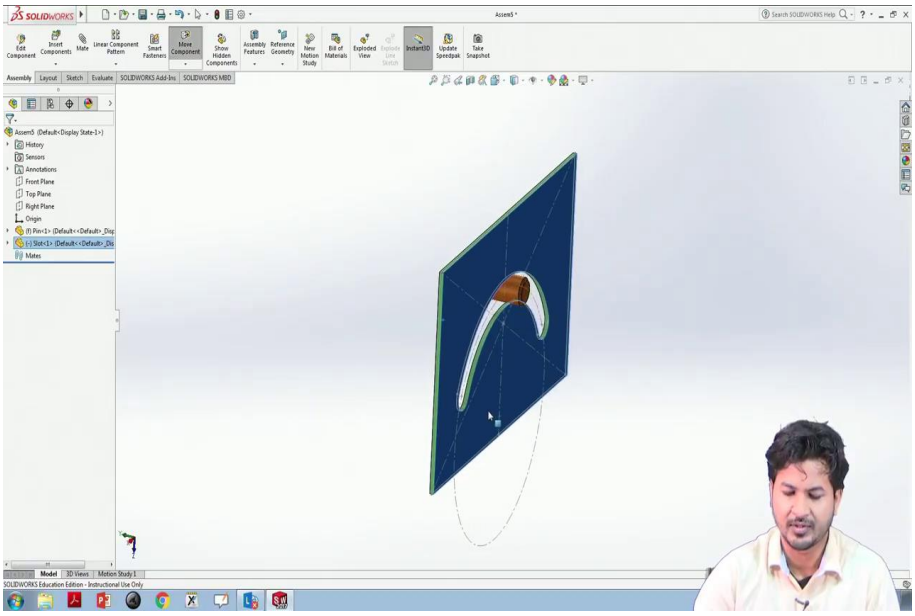

To do this, we can move this here and we can see how it works. This is supposed to be like this. Let us fix this one and make this pin as floating, right.

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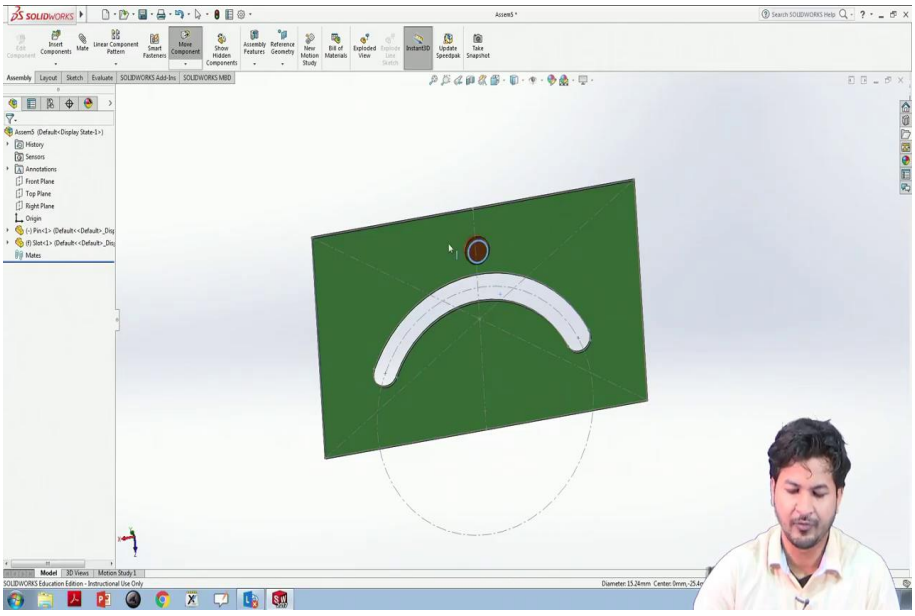

Because we have no mating as of now, we can move it anywhere.

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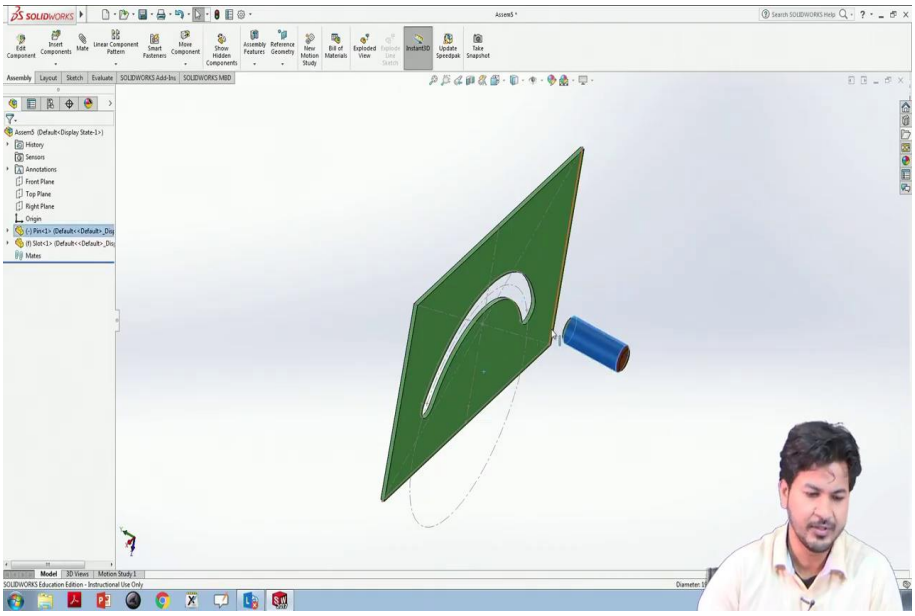

For now, let us try this tangent mate. I will go to mate in this tangent, we click on this small window again.

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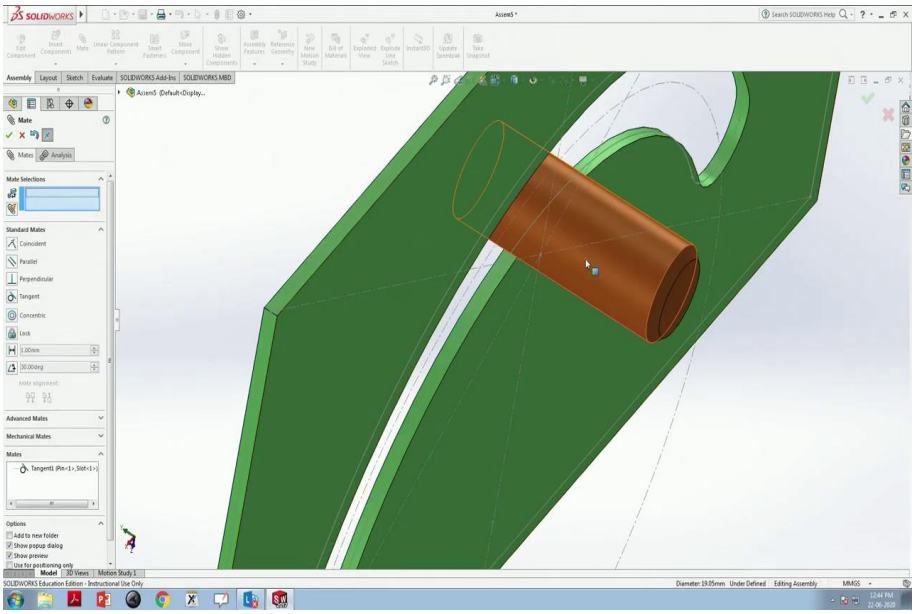

Select the circular surface and the surface it has to be tangent upon, and we will click ok, selecting tangent, we click ok here or either in the mini toolbox, finish. This is now tangent to this, this is now tangent to this surface. However, this we can see this moving because we have not constraint other degrees of freedom for this. So, we need some other constraints to lock this into this, within this slot.

So, for this, we can align the planes of these two, the slot and the pin into one another. To do this we will coincide it again that we have learned earlier. We will go to mate, we will select the planes of these two with these are the two geometry the pin and the slot geometry. We will check the front plane for this, the top plane for this the pin and the top plane for the slot.

If we control select these two we will click on the top plane for this slot and the top with control keys, key placed. We will select the top plane for the pin, and then click on mate, it will it is automatically suggesting to coincide or maybe we can select other things, but whatever it is suggesting to coincide it is going, it should be good for us. We click on ok.

Now, we can see it is logged now, and now we can see this moving within the slot and it is tangent to see, it the slot surface. The two mates we have used here is tangent, the surface of the cylinder and the surface of the slot and the coincidental planes of the both of these, the pin and the slot. So, this was tangent mating that we have discussed, ok, ok.

Thank You.