Engineering Drawing and Computer Graphics
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Lecture – 63
Assembly Drawing (Contd.)

Hello everyone. In the last lecture, we have learnt the basic elementary methods of mating that are available in SolidWorks that are generally used in assembling the parts in product design. So, we have learnt the basic methods. Now, we will apply those methods in designing one full product that is a single-cylinder engine.

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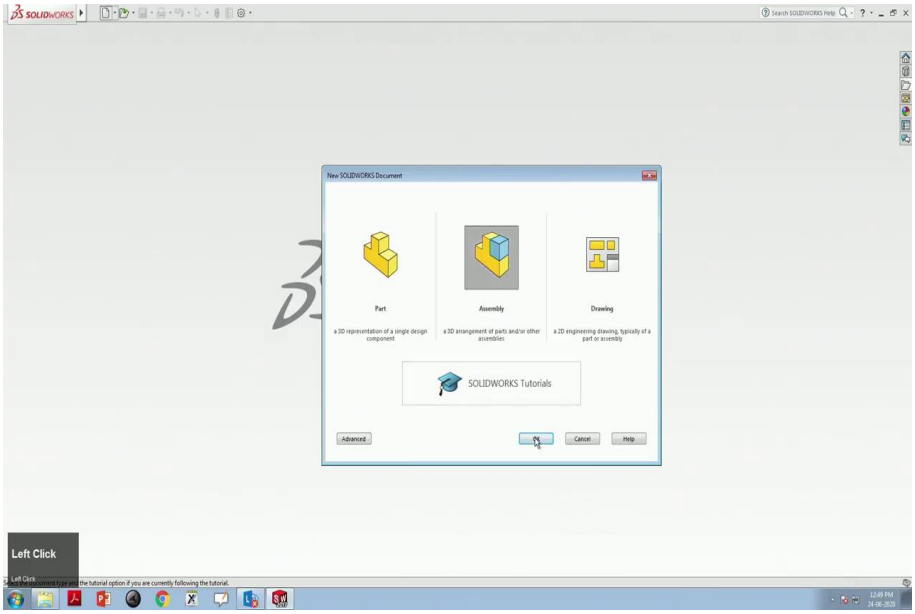

So, we will go by new in the same way we will open a new SolidWorks document that is we will work on assembly, click ok.

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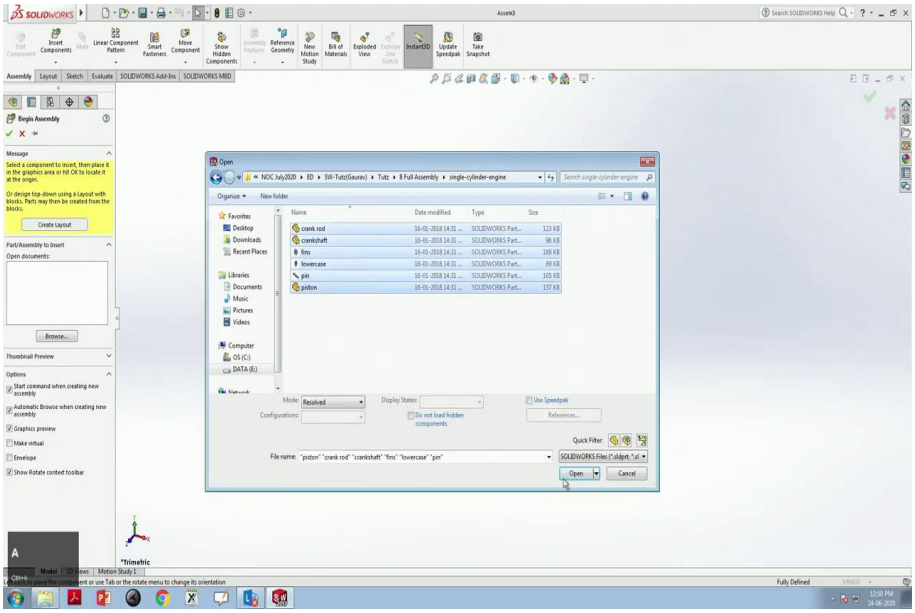

I already have prepared this 6 parts to develop this single-cylinder engine. We will select all of these.

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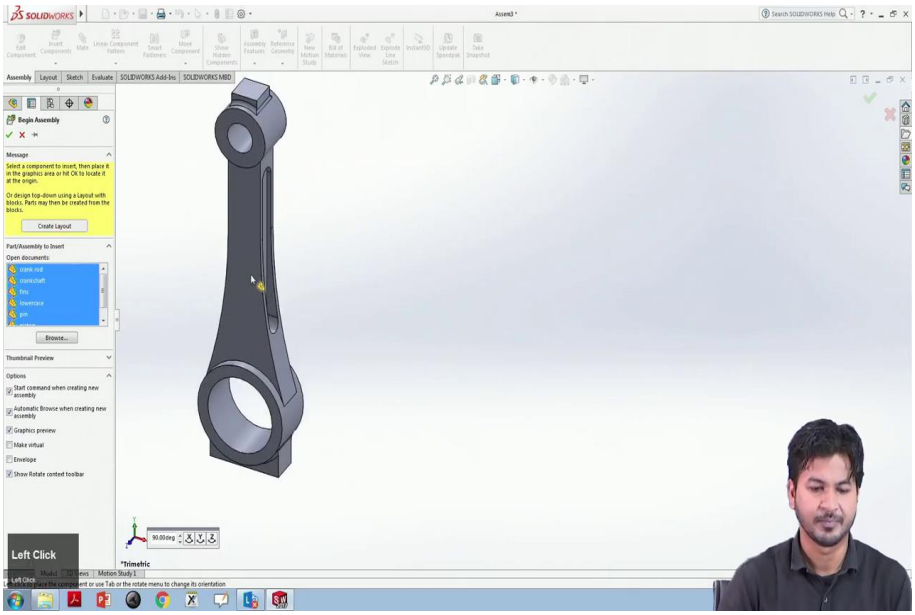

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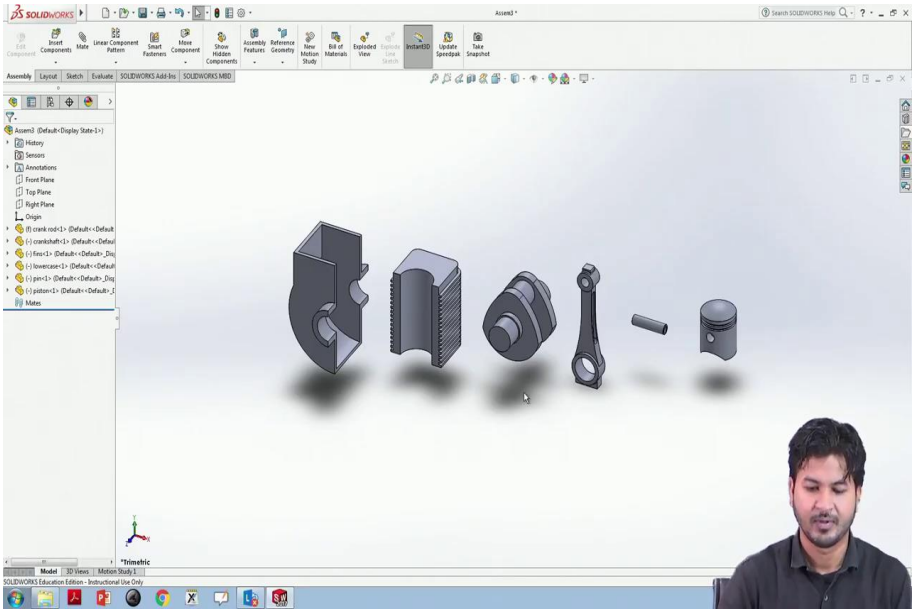

And I am placing it one beside another. This is the crank rod; this is crankshaft; the fin casing; the crank casing; the piston pin and the piston itself. We have this six-part needs to be assembled. So, as far as what we have learned, so we will use those this knowledge to fix this.

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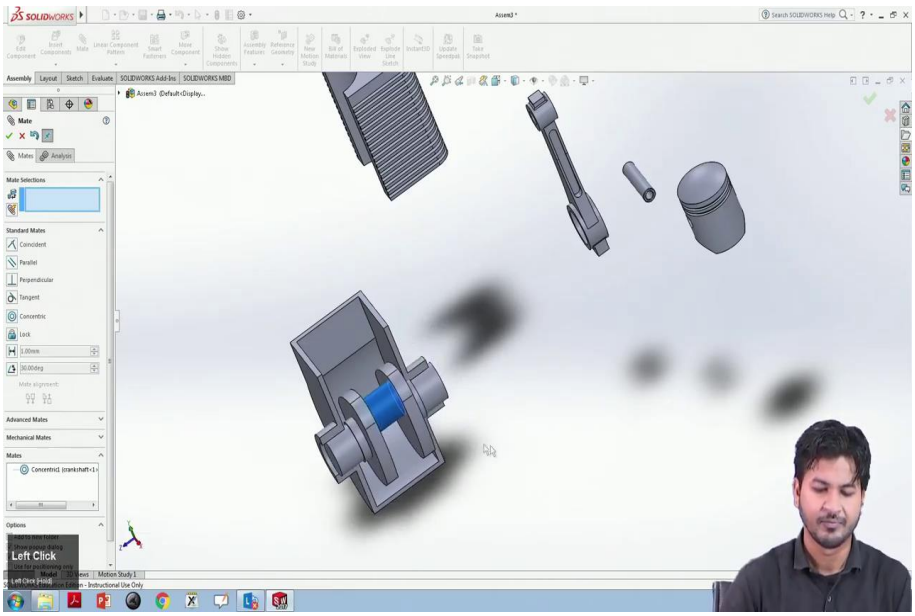

So, let us pick this crank casing and fix this for the reference. So, we can intuitively understand that this crank is supposed to be fit in this slot. You can make a guess what mating method is supposed to be applied to fix this into this. The correct answer is concentric relation. This part, this cylindrical surface needs to be concentrated with this casing cylinder and will mate it up, click ok.

So, this has been assembled in a way that this crankshaft is concentrated with the crank casing. However, this can move in the lateral direction. For the fixing this, we need to coincide this edge of this crankshaft and this particular edge of the crank casing to coincide with each other. And we will click ok on this mini toolbar. So, now, this is very well fixed, and the only degree of freedom remains the rotation.

Now, we can fix this fin over this crank casing as a covering for the single-cylinder engine.

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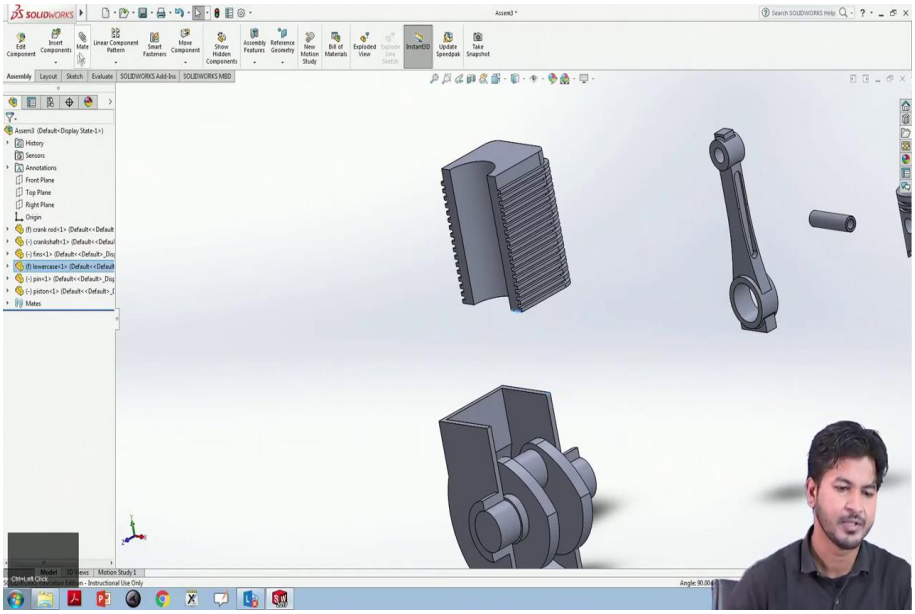

For this I am selecting this particular edge and this edge, I will mate it up, you will click ok.

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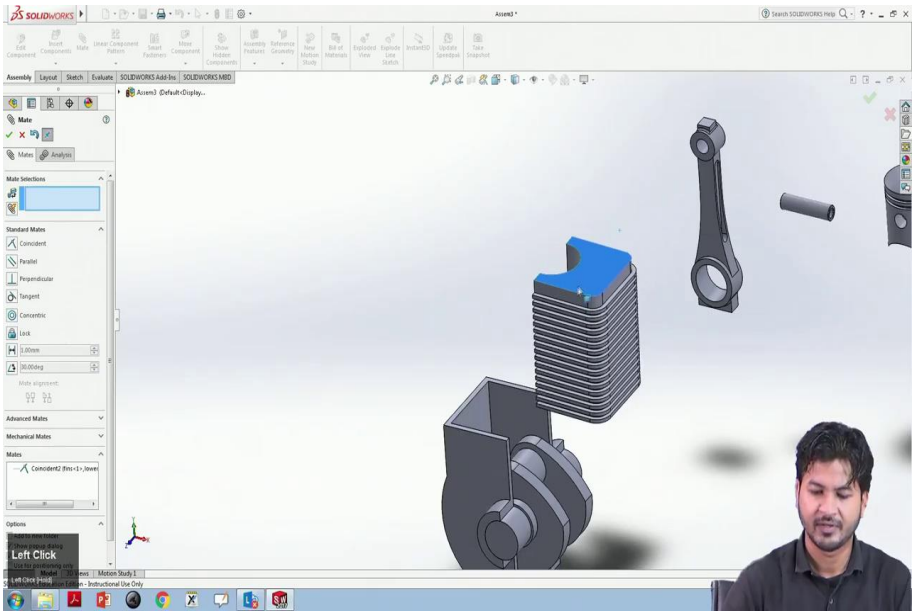

So, now, we can see this is mated with aligned with this edge.

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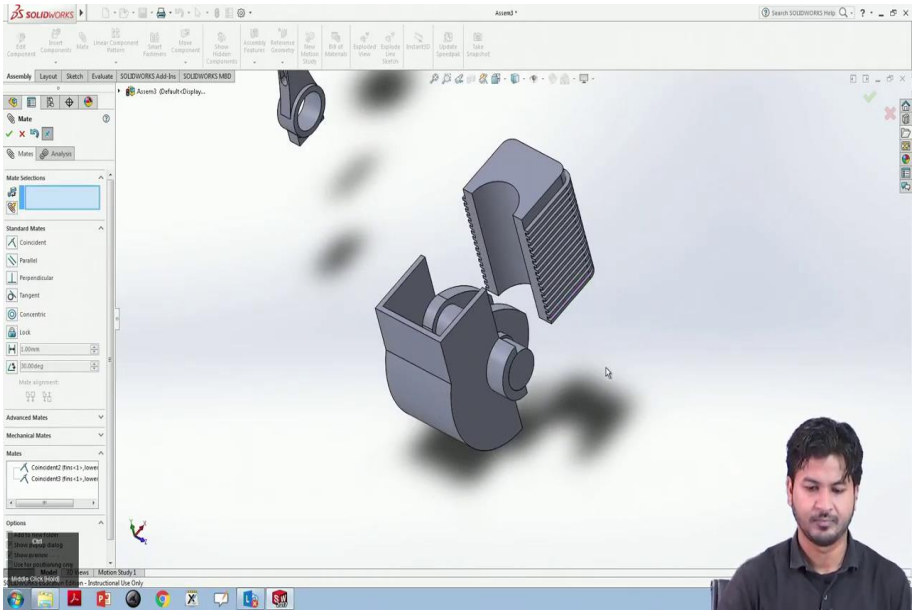

So, now, we want this fin to be rotated to be placed over this crank casing. For this, I am selecting this edge and this edge of this crank casing, I will select it ok. Now, we have these 6 parts of the single-cylinder engine to be assembled into one another with particular assembly relations. First of all, we will pick this crank casing.

And by intuition, we can see that this crankshaft is supposed to be fixed into this crank uh casing. This crank, you can just guess what relation does it need to be to for this shaft to be fixed into this crank casing? The correct answer is the concentric relation.

You can just select these two surfaces we will click on mate, and it automatically guesses this concentric relation and click ok. Now, we can see it is successfully fixed into the slot. However, this can mate this can move in the lateral direction.

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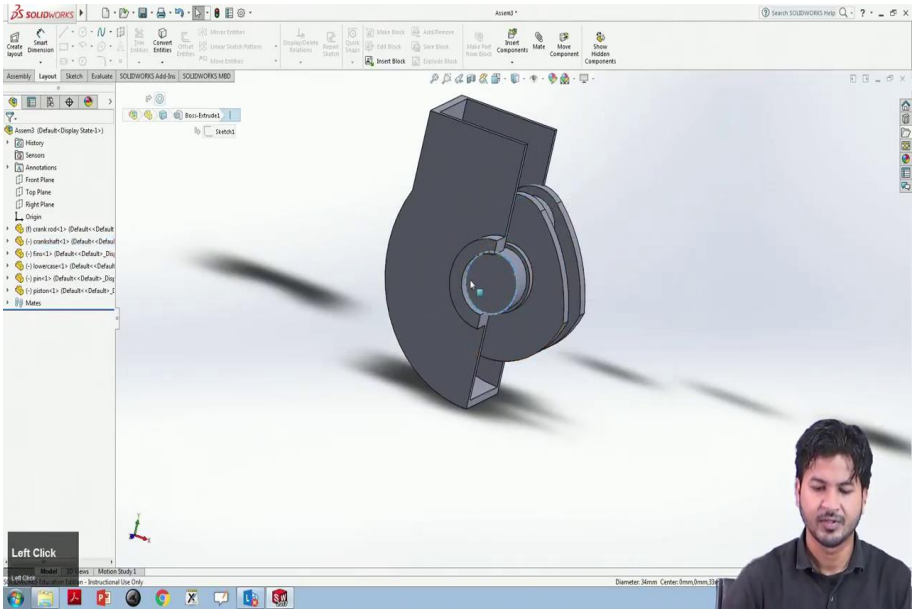

To fix this, what we can do is we will have to coincide this particular edge with the edge of this crank casing. And we will mate it up, and we will lock it. So, now it is nice and good, and we can see this.

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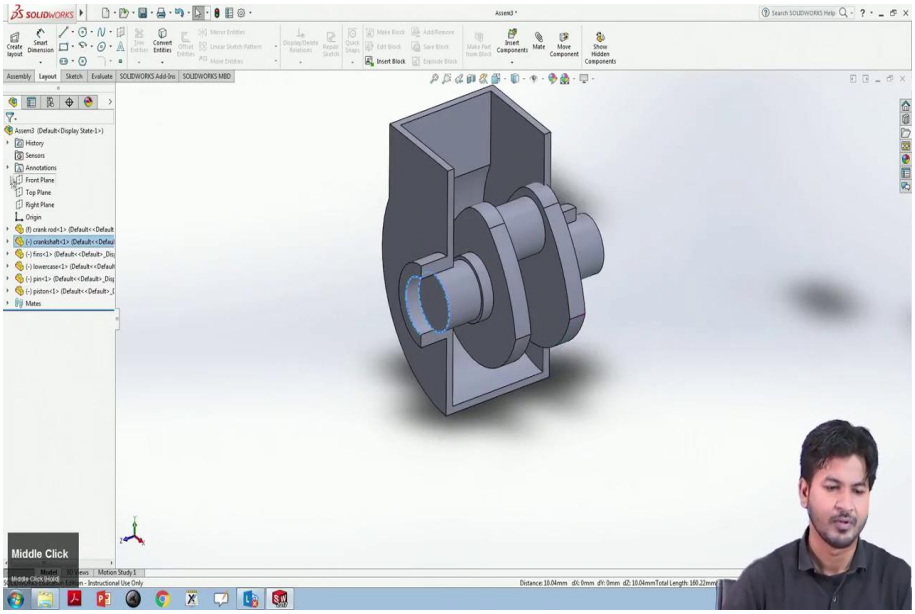

Now, we have the 6 different parts for this single-cylinder engine. And we will assemble this one by one assuming the perfect relationship between the parts. So, first of all, we will take this crank casing. And by intuition, we can guess this crank crankshaft is supposed to be fit into this crank casing. You can just guess what relation does this crankshaft needs to have with this crank casing.

The correct answer is concentric relation. We will have we have to select these two surfaces we will go on mate, and it is successfully detected this concentric relation with each other we will click ok. So, you can see this has a concentric relation.

However, it can move in the lateral direction. So, to fix this we will select the two edges of the crankshaft and this crank casing and we will make it coincide and we will select ok in this mini toolbar.

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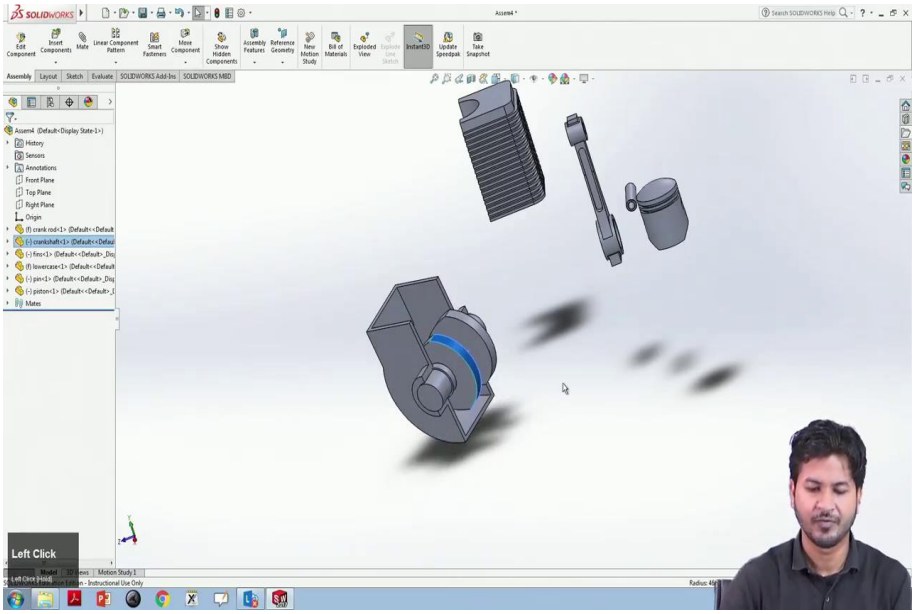

Now, still, we can see this crankshaft to move in the lateral direction. To fix this, we will select the two edges, this edge and this particular edge to make it coincide with each other. So, now we can see this is nice and good, rotating only in one degree of freedom, and it cannot move in the lateral direction. Now, let us fix this crank this fin casing over this crankshaft, sorry the crank casing.

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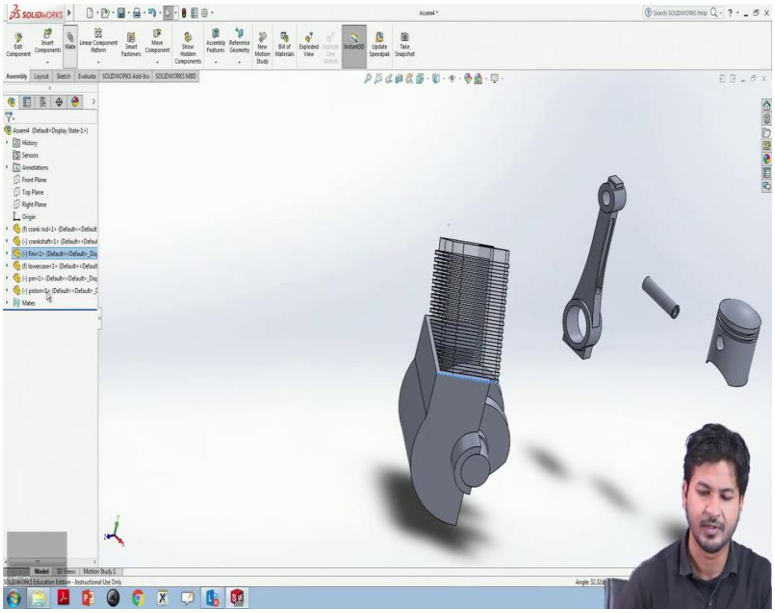

For this, we will select this particular edge and this edge of the crank casing, we will mate it up to coincide. Click ok, this is mated successfully.

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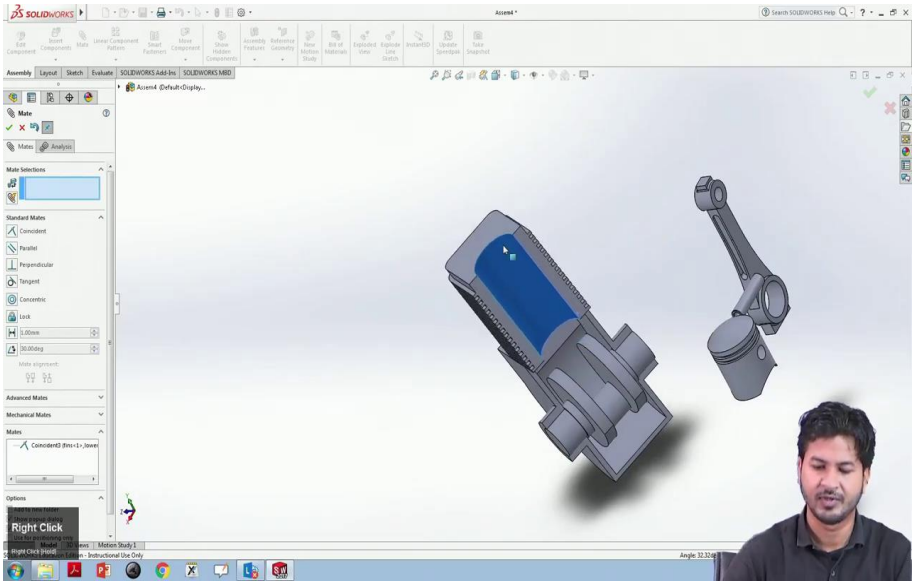

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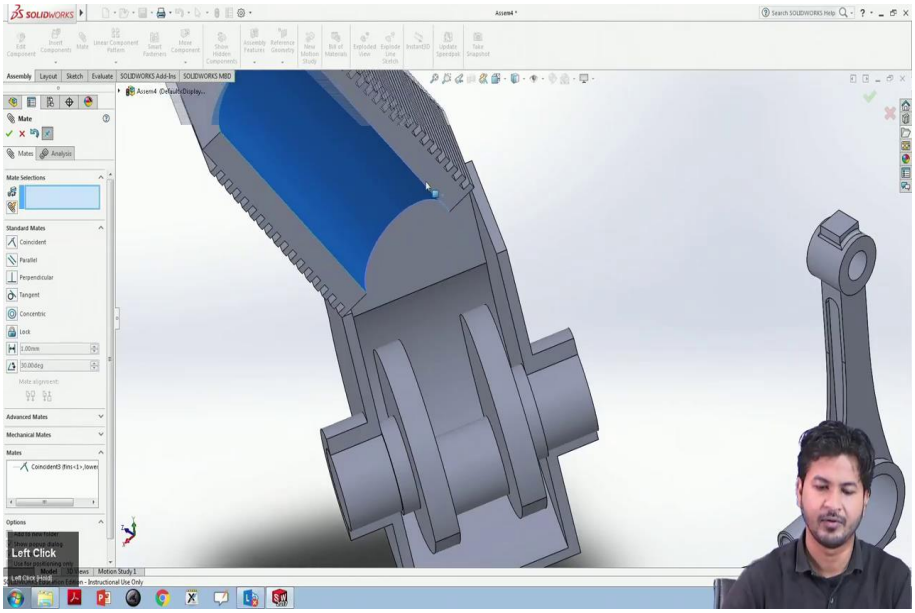

So, however, it can rotate or move in other directions as well.

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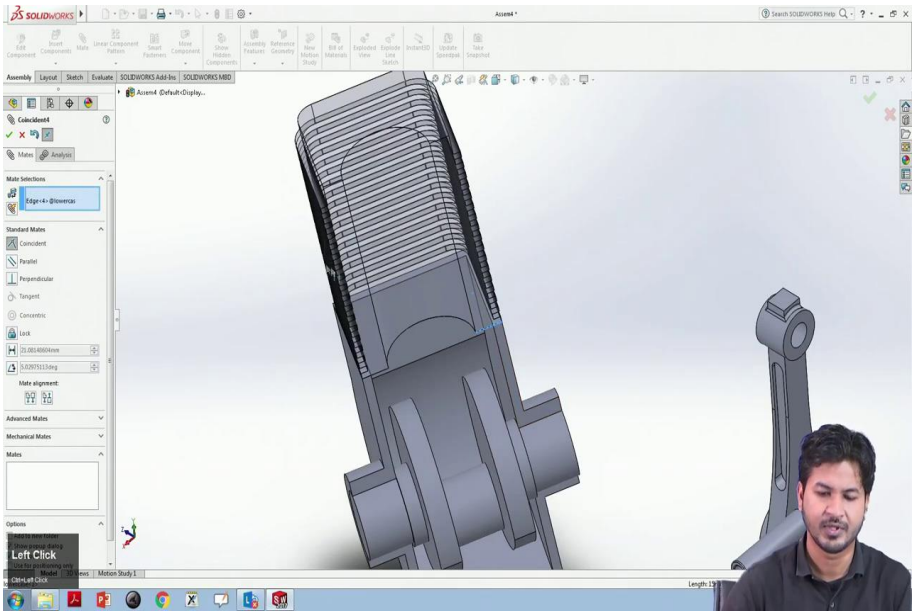

To fix this I will select this edge and this edge to coincide, and it successfully aligns over the crank casing.

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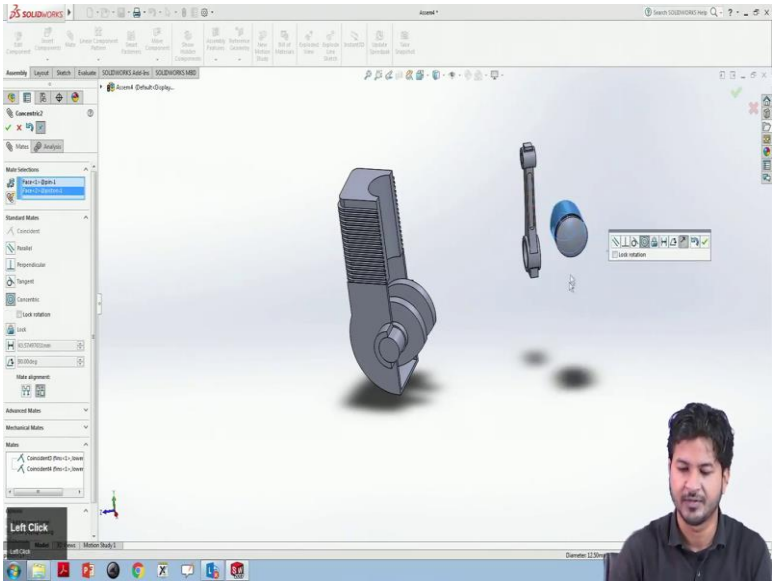

Now, there remains the three parts, the crank rod and this pin and the sorry the piston.

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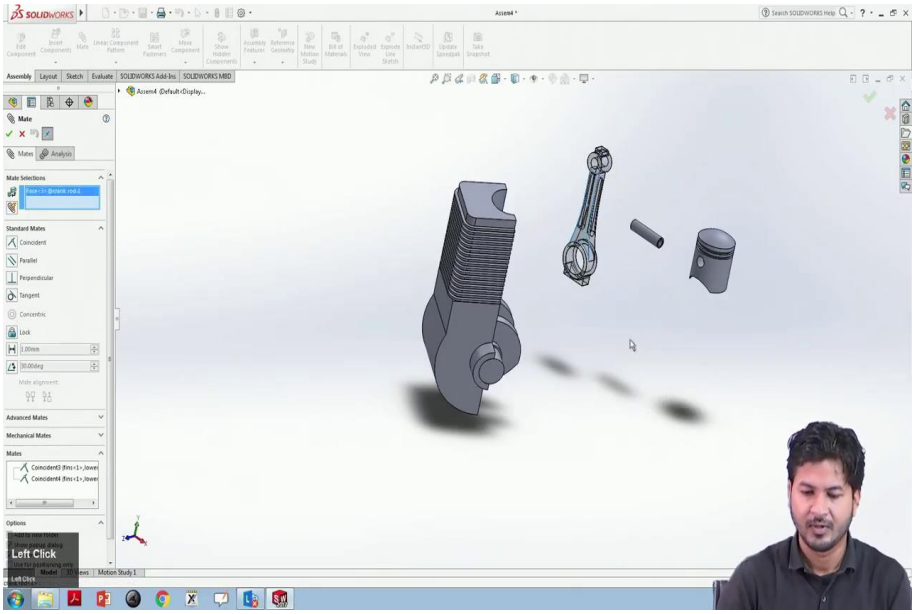

So, this crank rod is supposed to be attached with this crankshaft. So, so that it can move as it as the crankshaft rotates.

So, for this, we can guess that this particular hole in this crank rod is supposed to be supposed to have a concentric relation with this crankshaft. We will select this surface and this surface and will mate it up as concentric.

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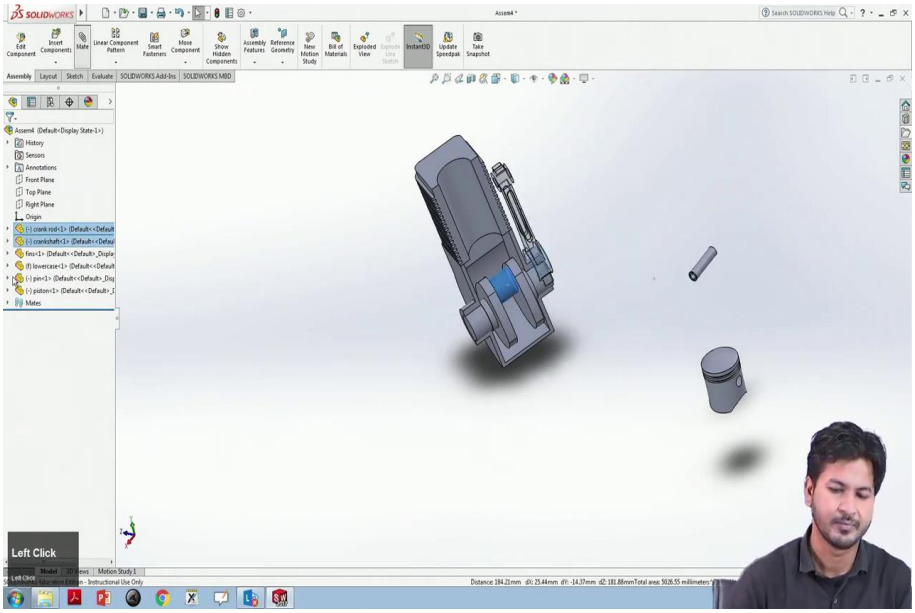

You can see it here. Now, to attach the piston over it, we will select the piston for this.

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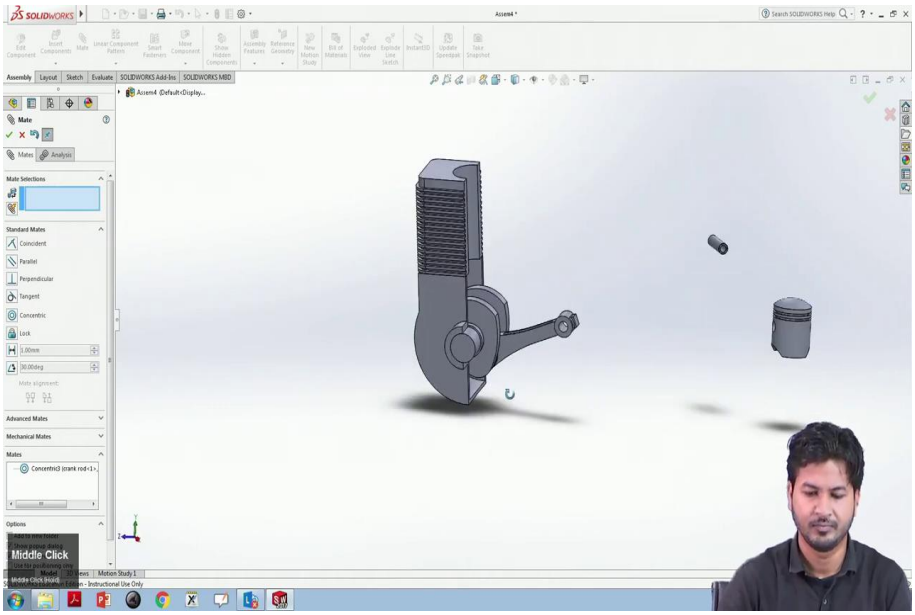

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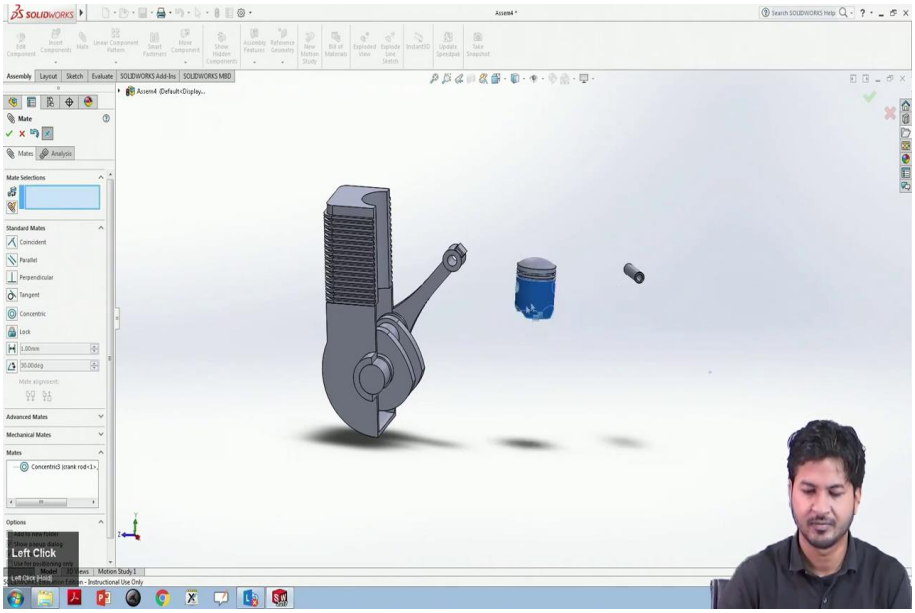

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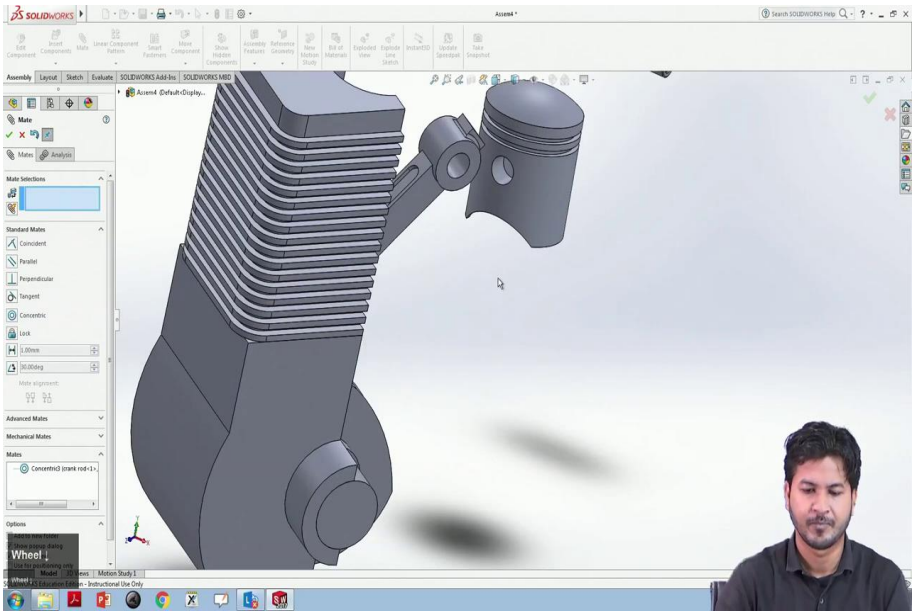

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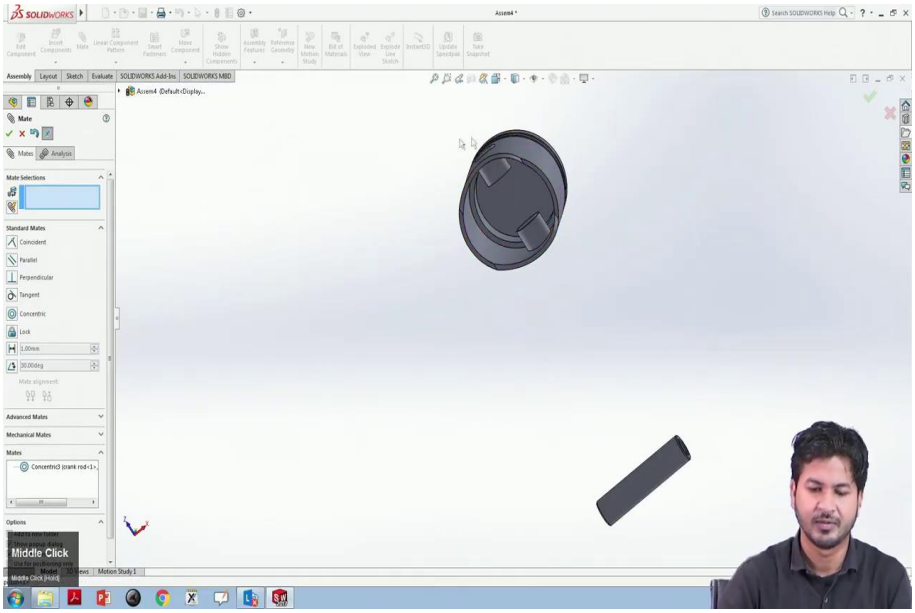

Because this piston has the crank rod has to be fixed in this zone.

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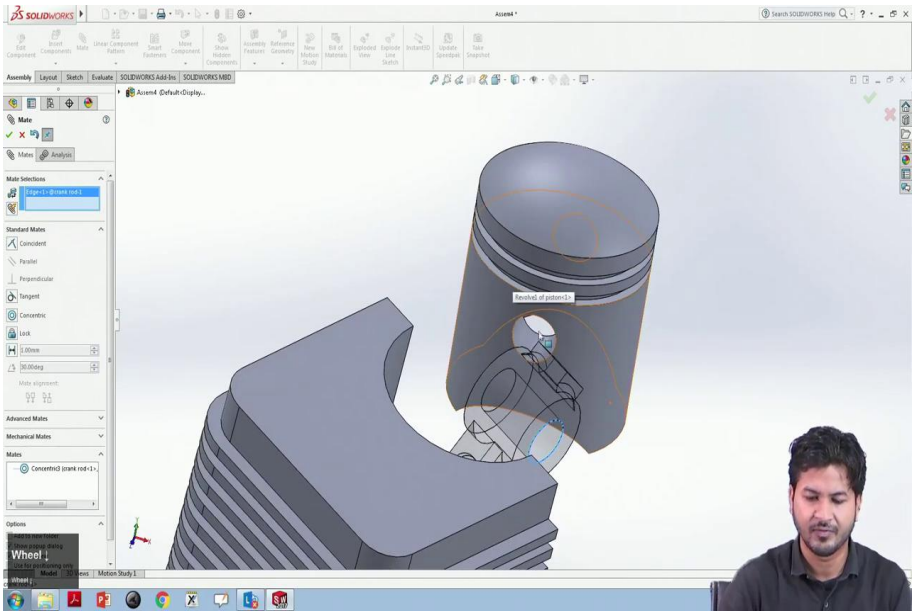

So, for this, we will select the edge of this crank rod and the edge of this piston inner side, and make it coincide, and we will click ok.

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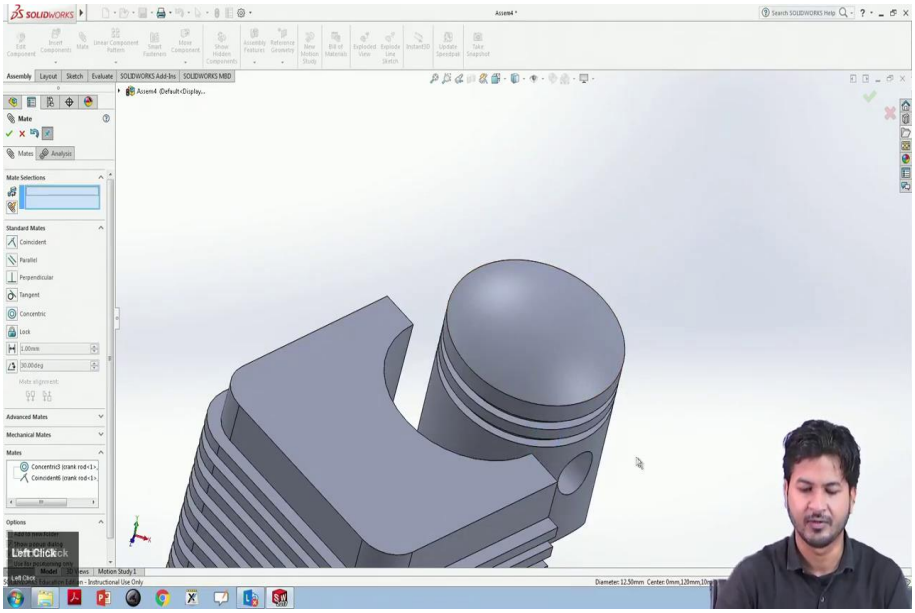

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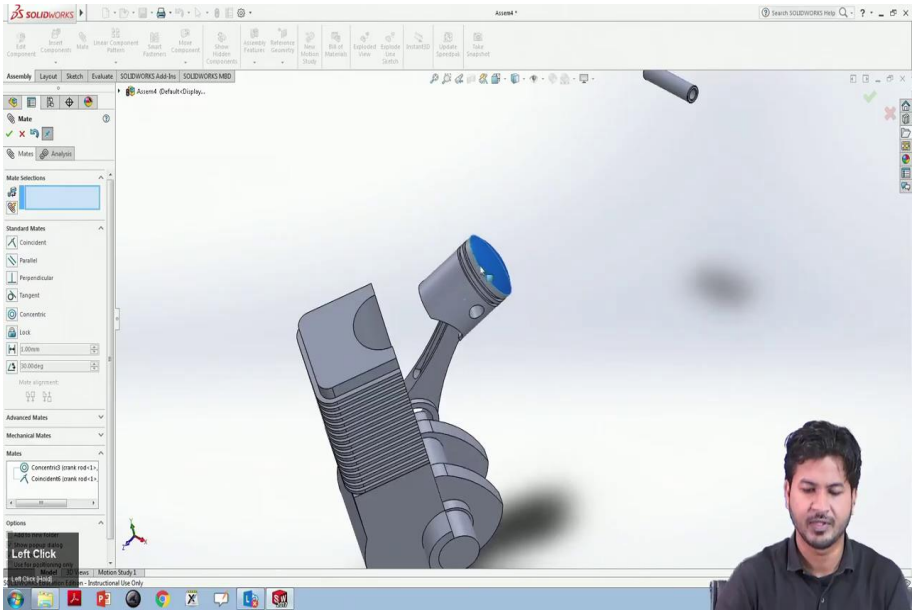

So, you can see that this piston has been fixed in this. And in the end we, can we have to insert this pin. And this pin surface has to be concentric with this space. We will select the surface here and it fixes as concentric.

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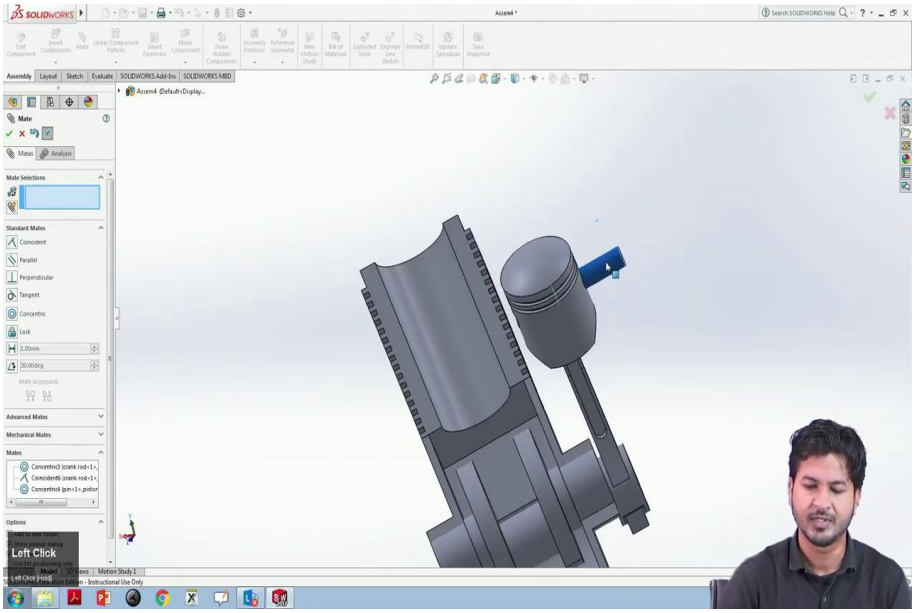

However, this pin can may this pin can move in lateral direction.

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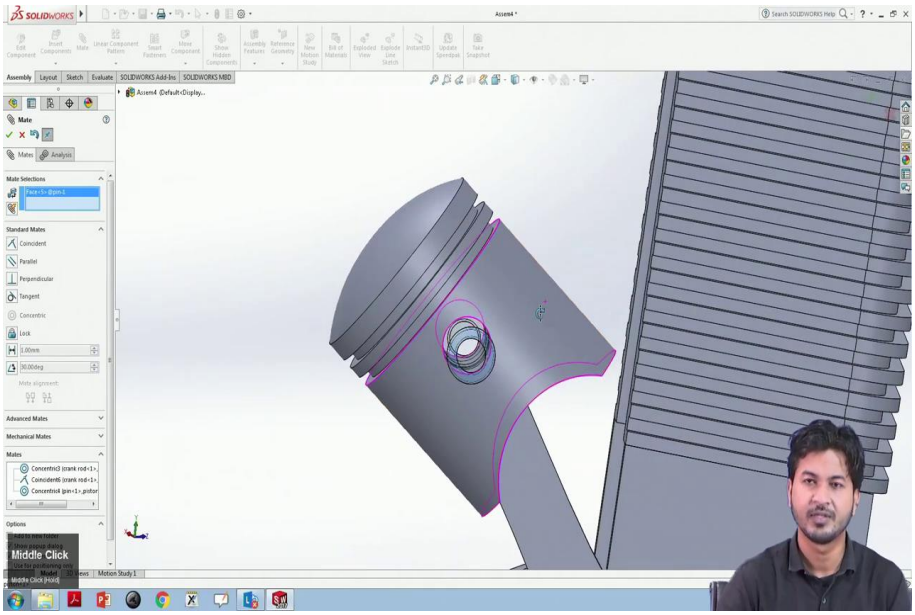

To fix, this we will have to make another relation that this surface of this pin is supposed to be tangent over the cylindrical surface of this piston. We will select these two. And it the mating uh solid works mating automatically detects the tangent relation. And we will click ok.

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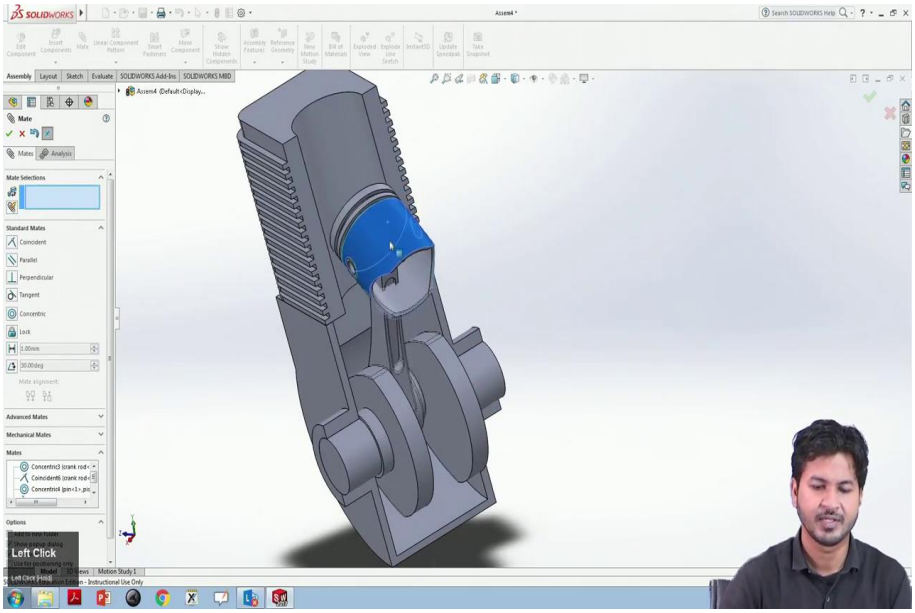

So, it fixes. Well and good. So, still, this needs to be fixed in this fin casing. For this, we can as we can guess that this fin casing is supposed to be concentric with this piston, and we will click on the on mate. And we will directly see concentric relation and click ok.

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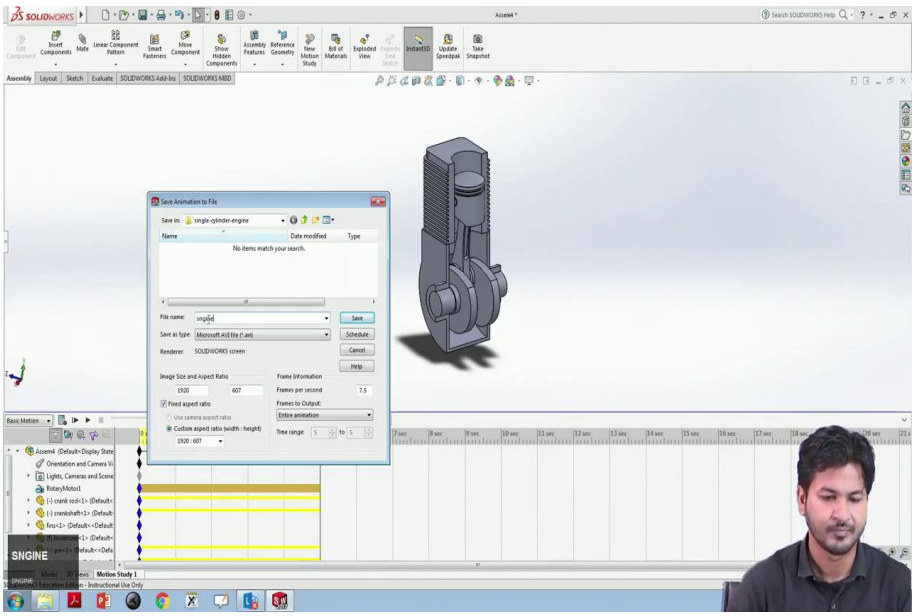

Now, we can see here that this relation is this assembly is very well assembled, and this engine works nice and good. To see this engine in motion, SolidWorks also features this simulation. For this, we will have to go to this motion study. The in-motion study, in bottom pane, we have this motor option. For this, motor, we have this motor option. In this motor, we will select the motor.

This asks for the component which has to be rotated that if it were, solid work features this motor option over here. In this motor option, this asks for a component that has to be rotated if it were acted upon by a motor. So, we will want this crankshaft to be rotated by the motor.

We will select this. We can we will select this rpm for this motor that we need to apply. Let us make it 50 and we will click ok. And in the settings, motion settings, we will make the frames per second as say 30, you click ok.

So, now here in the tool animation toolbar, we will select basic motion, and we will play. You can see this animation running well and fine. You can also increase the duration of this. Currently, it is only 5 seconds.

You can see the motion of this engine, and single cylinder sorry. Now, you can see the motion of this piston and the crankshaft in relation with this crankshaft crankcase and the fin as in a single-cylinder engine. It is working well and good.

To save this kind of animation, we will go with save the animation. This allows us to save this animation that we just saw in a form of a media. So, we will select this we will name this as engine and we will save.

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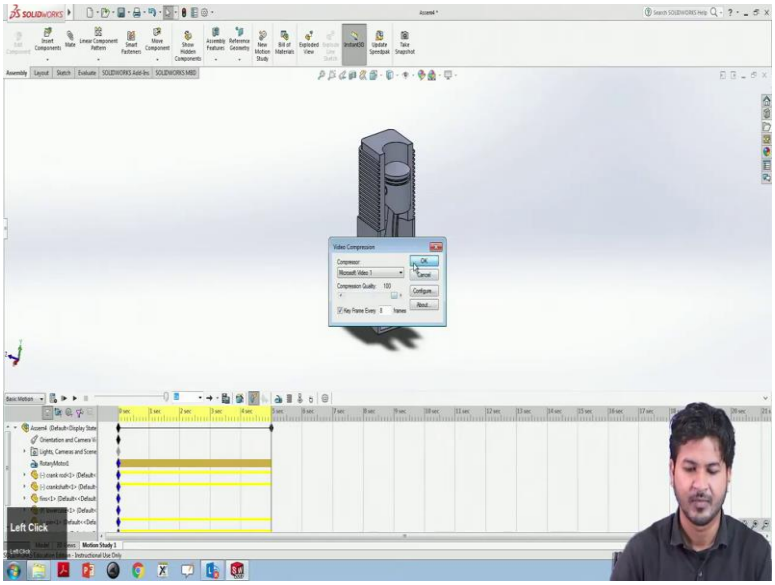

This asks for this compression quality, we will ok.

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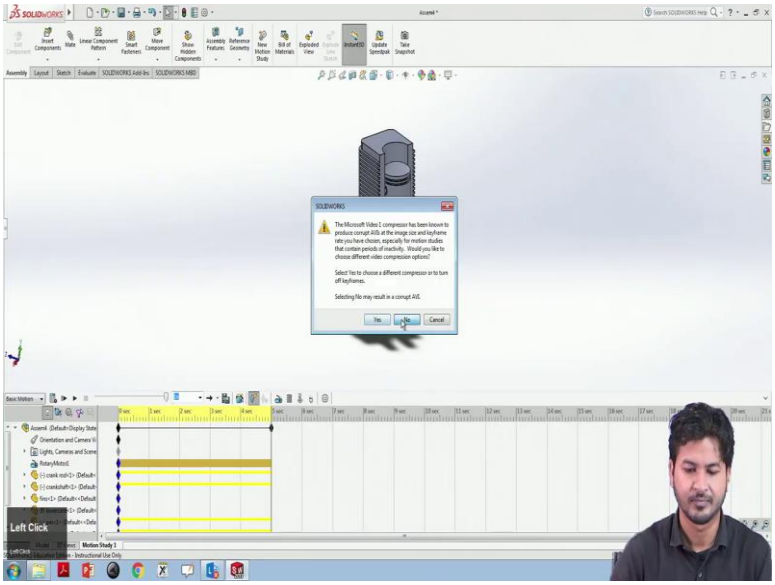

It takes time to simulate. Now, we can see the file that is developed here that is generated.

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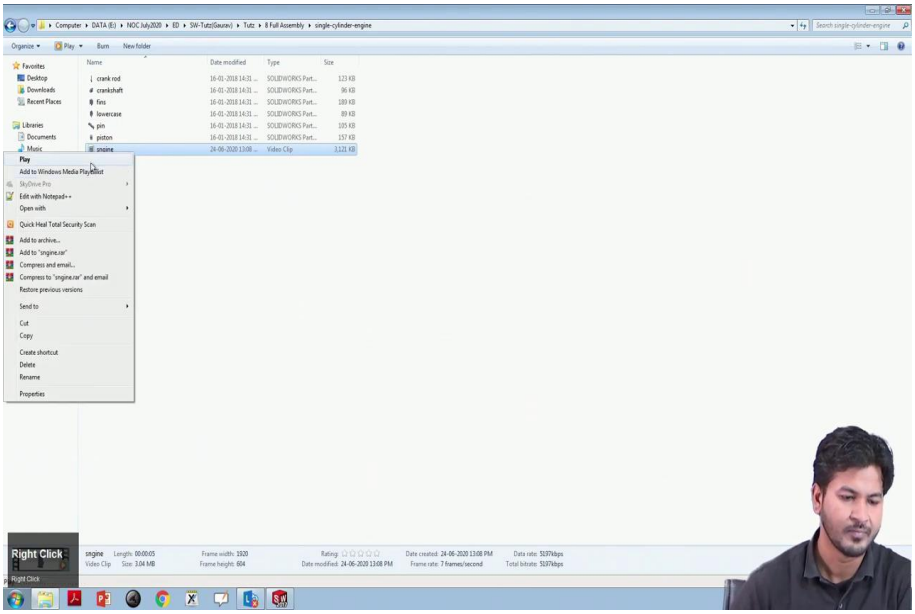

This is you can play it over here.

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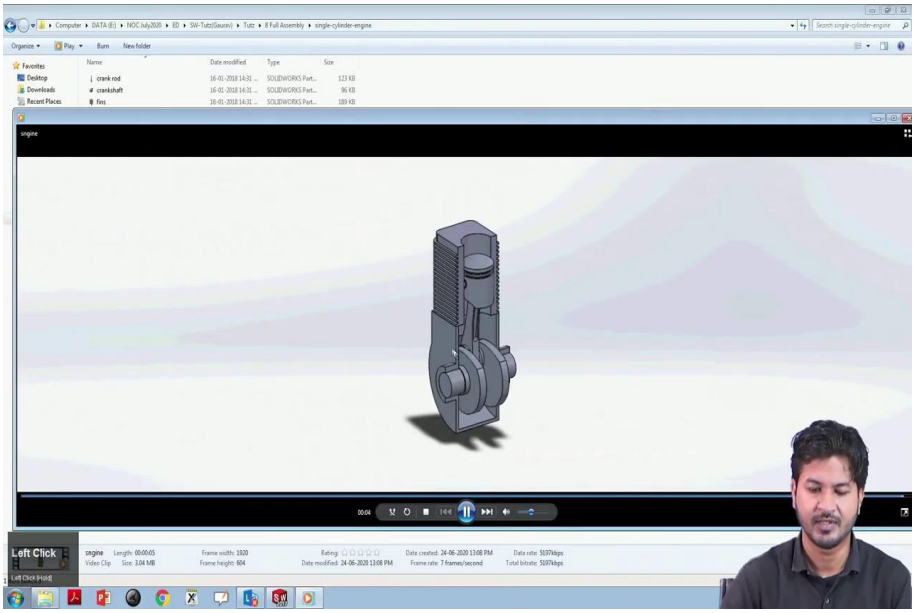

This is the animation generated for this single-cylinder engine. So, now, this was the motion study in the SolidWorks features. So, in the end, I would like to also tell you about explode view that we initially saw in the case of scissors, the wind the windmill and the tractor.

To see that, we have this option exploded view.

We will click on this exploded view. Now, this exploded view has a pane, and these are the settings for that the exploded view. For this, we have to select one any one of the parts. This gives three-axis that the that allows us to move this part in the three directions.

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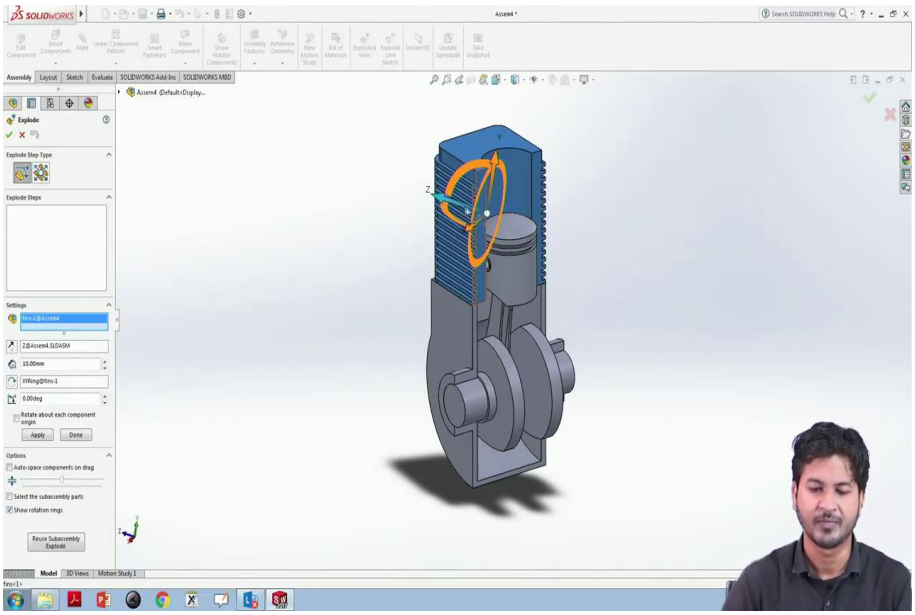

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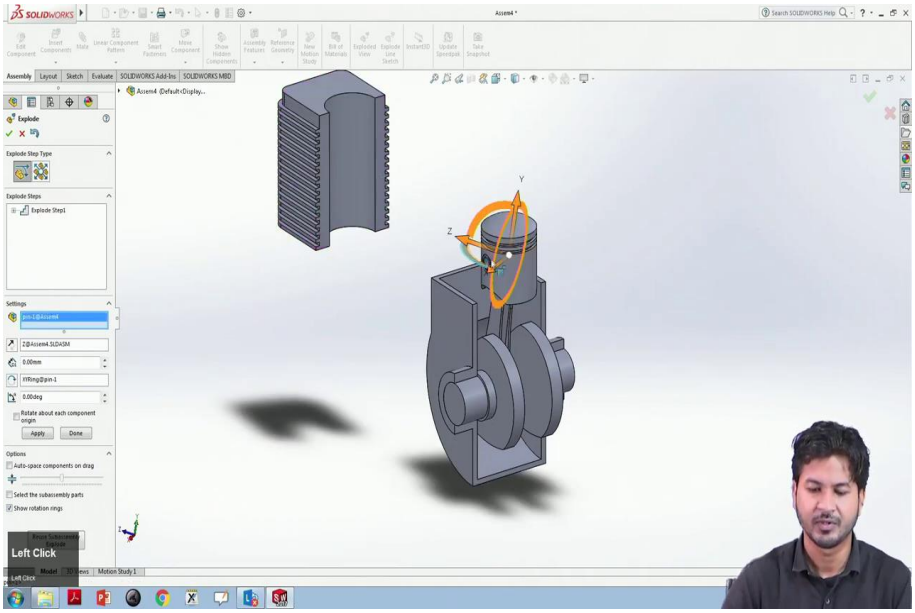

So, let us select this Z-direction. We will move this casing in this backward direction.

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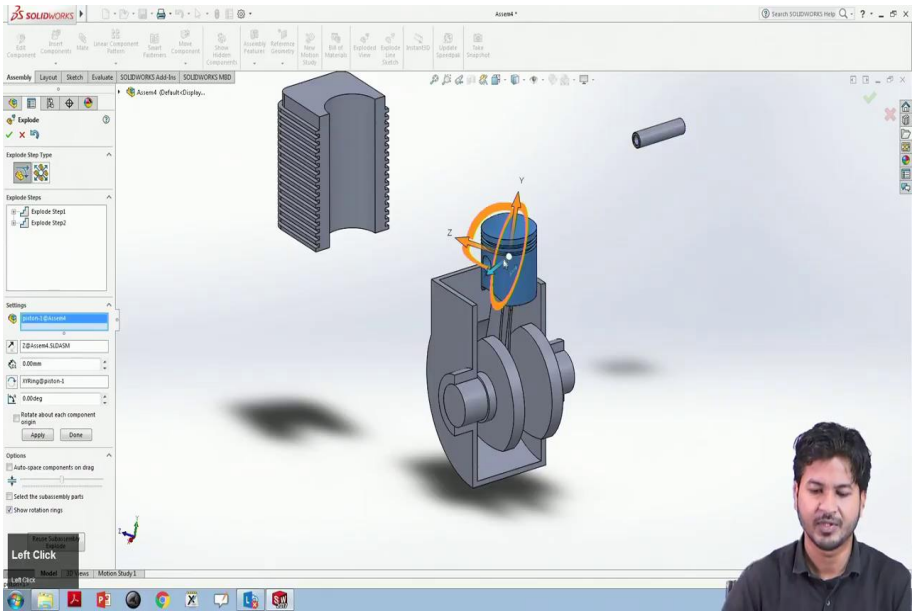

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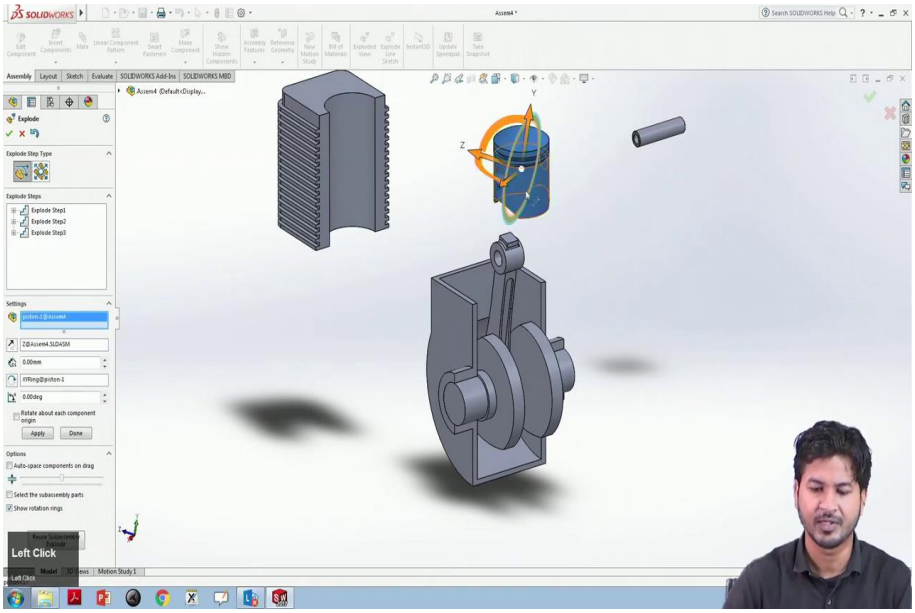

Now, we will take this pin out in the X-direction and we will move this piston on the top.

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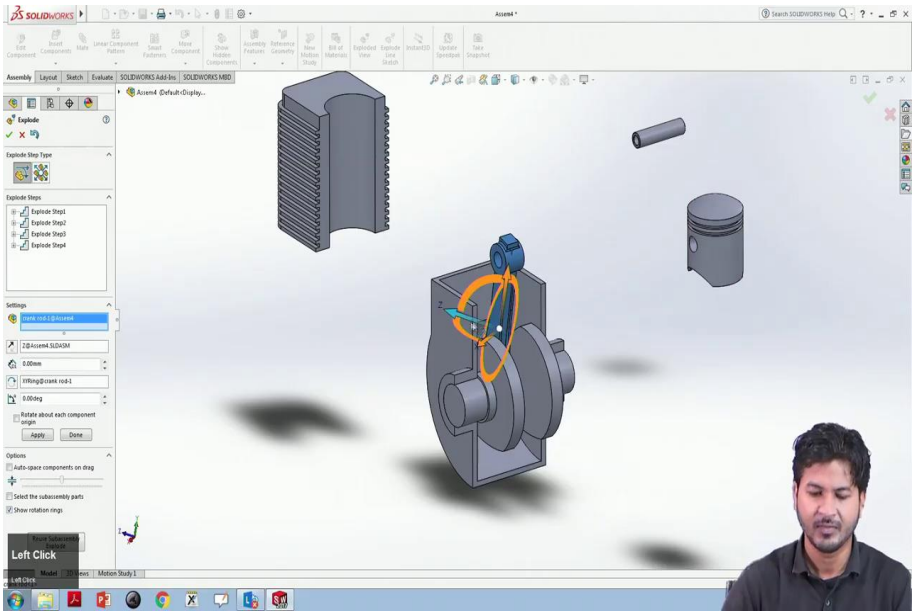

And we can also move two-way motion additional motion in the piston say Z Y and Z. We will take this crank rod out of it.

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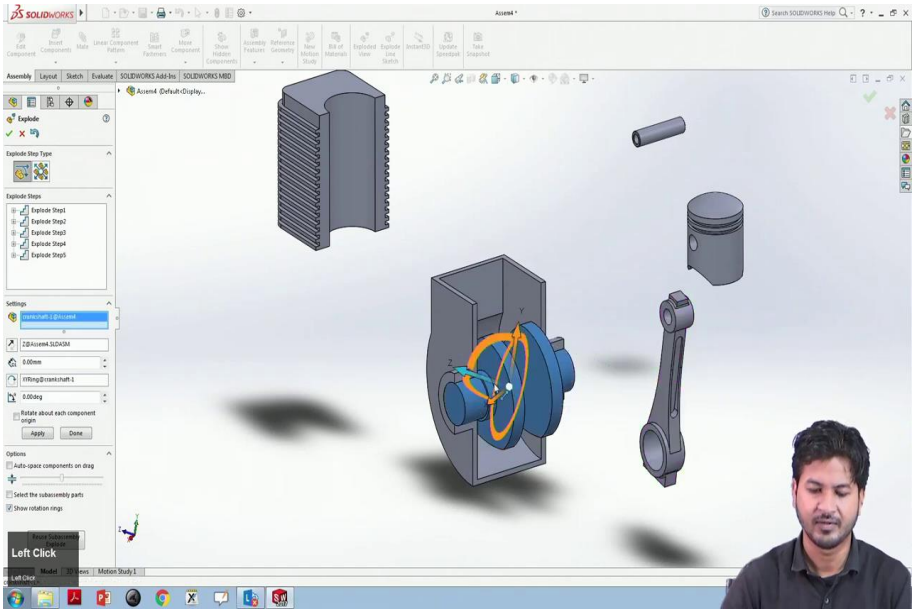

And this crankshaft in the X positive X direction, and this crank casing in negative Y.

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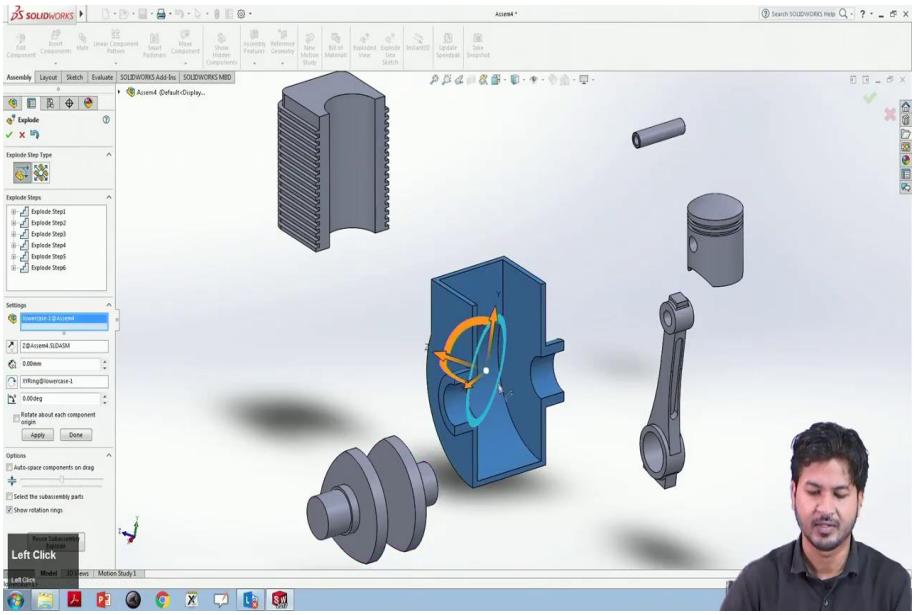

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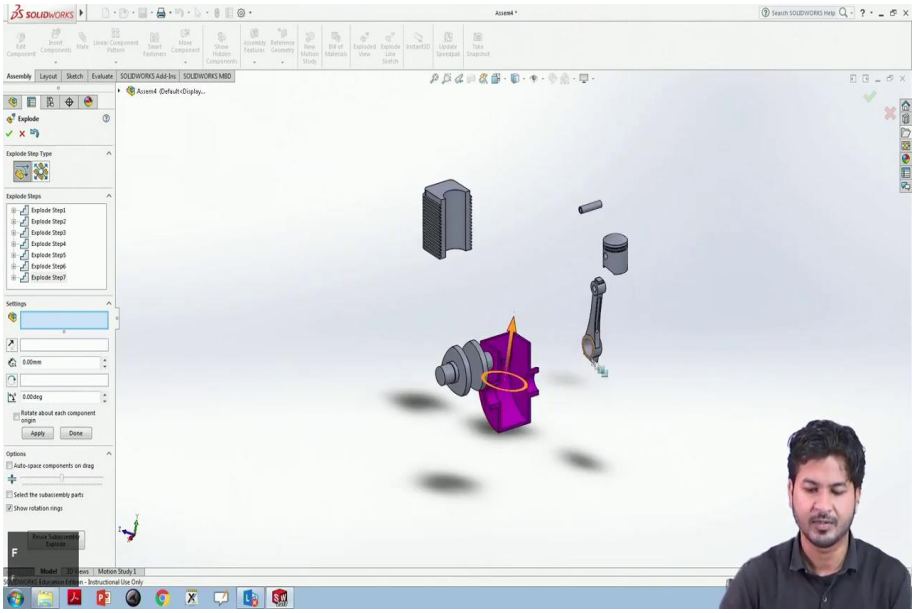

So, this completes the explode view for this single cylinder piston assembly.

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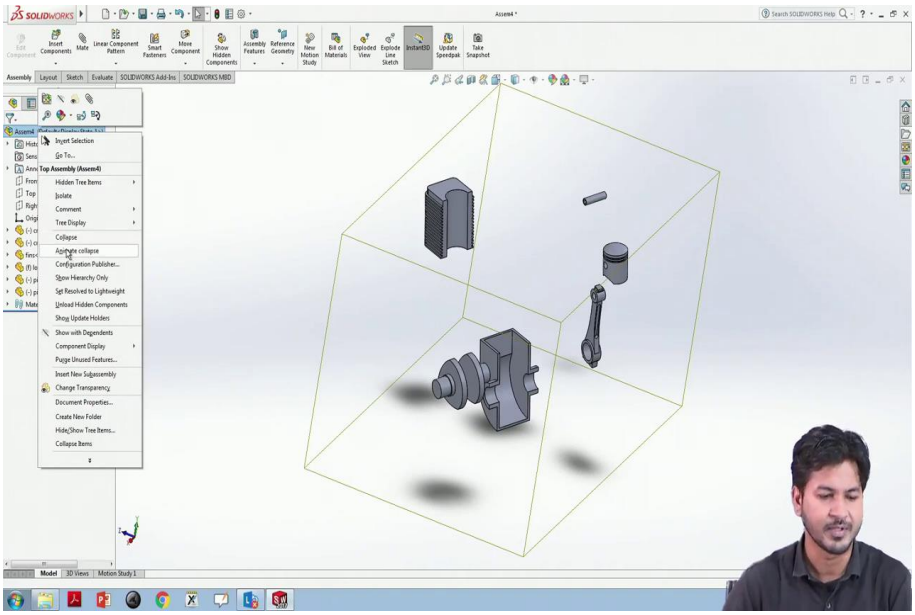
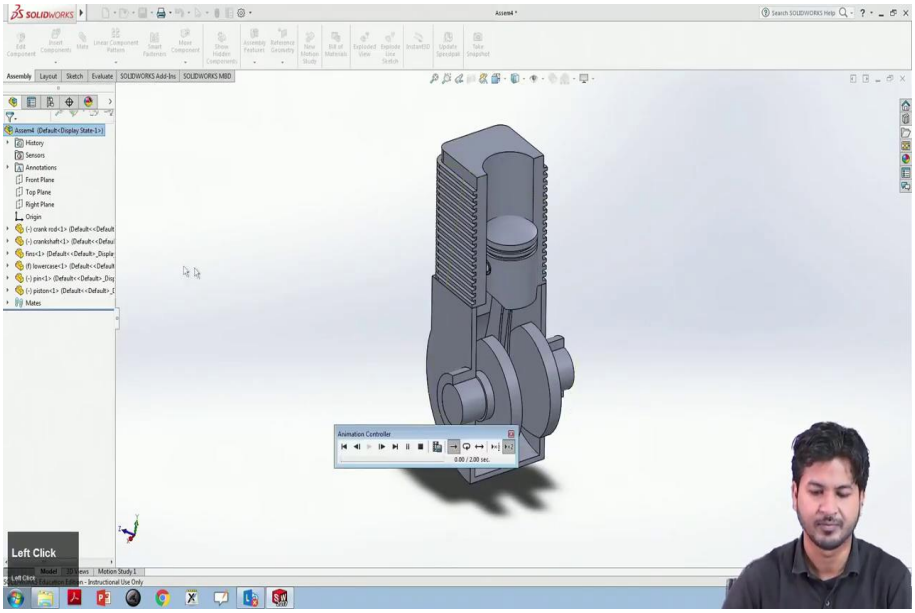


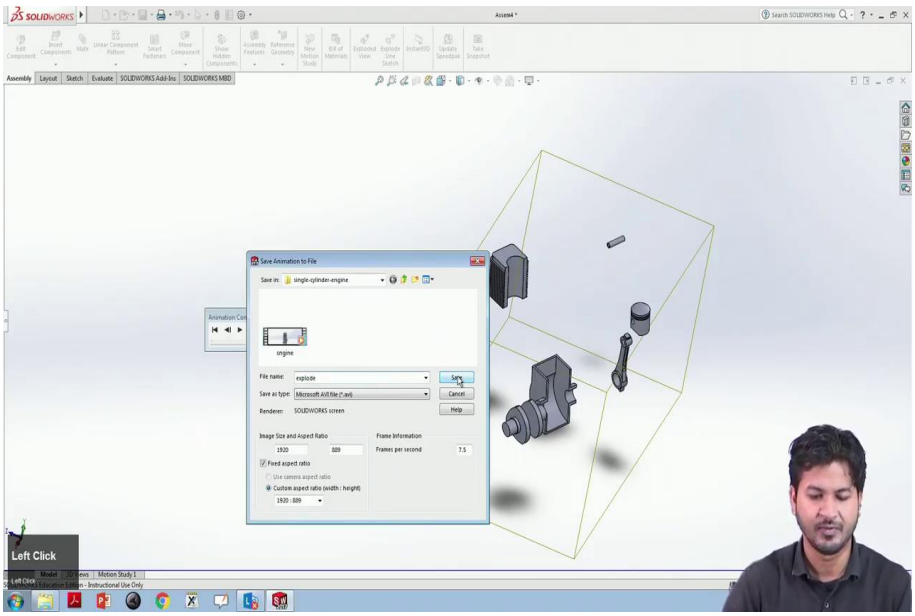
And we will once we click ok, the explode view completes. To animate this explode view, we will have to go to this assembly. We will click on assembly and we will select animate collapse.

(Refer Slide Time: 22:05)



So, it will collapse in the way as we have exploded it. So, here is the toolbar for this animation. We can speed it up or we can slow play it. Similarly, in case once it is collapsed, we can also animate it as exploded, animate explode.

(Refer Slide Time: 22:31)



Similar to like that we have done in this motion study, we can also save this movie as a media. We will select save the animation. We will select explode as file name and we will mark it save ok.

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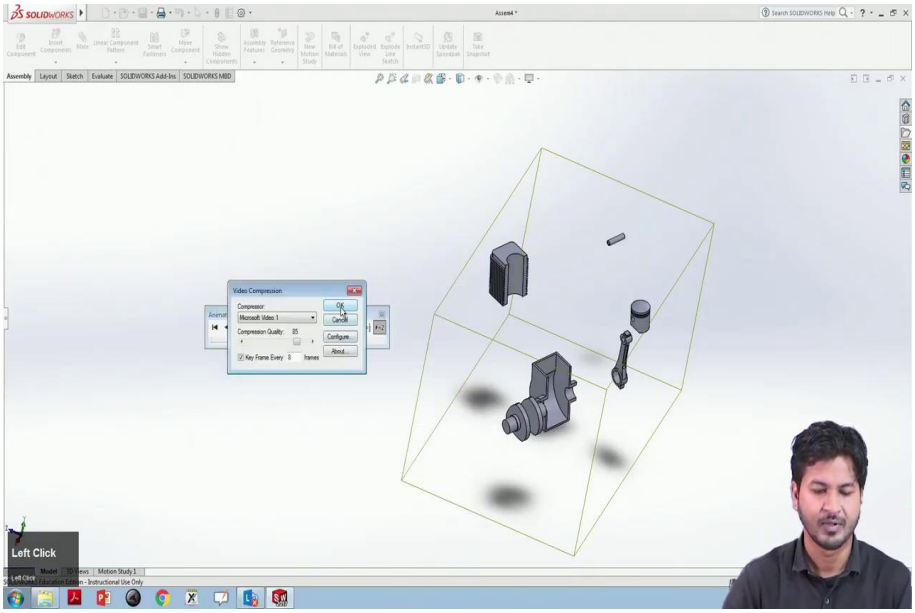
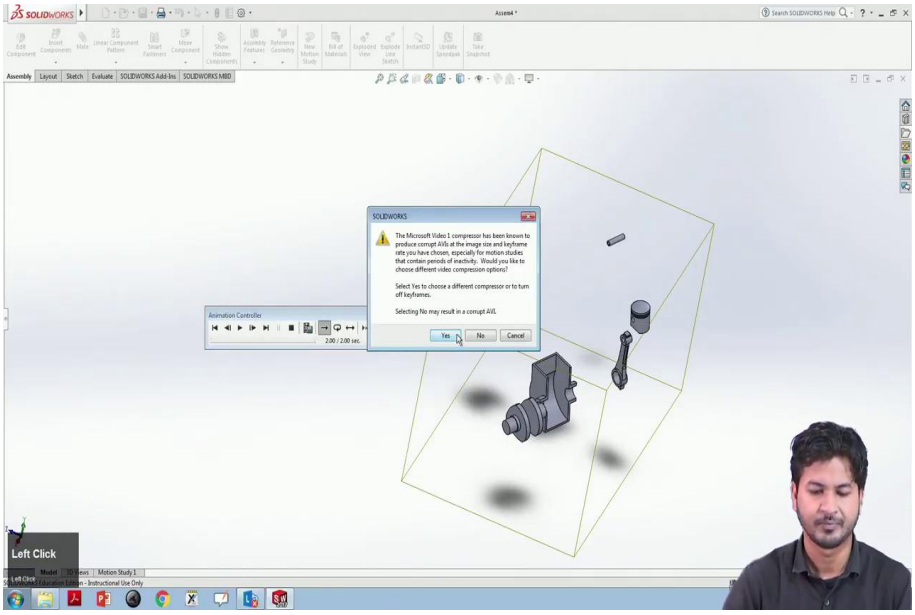
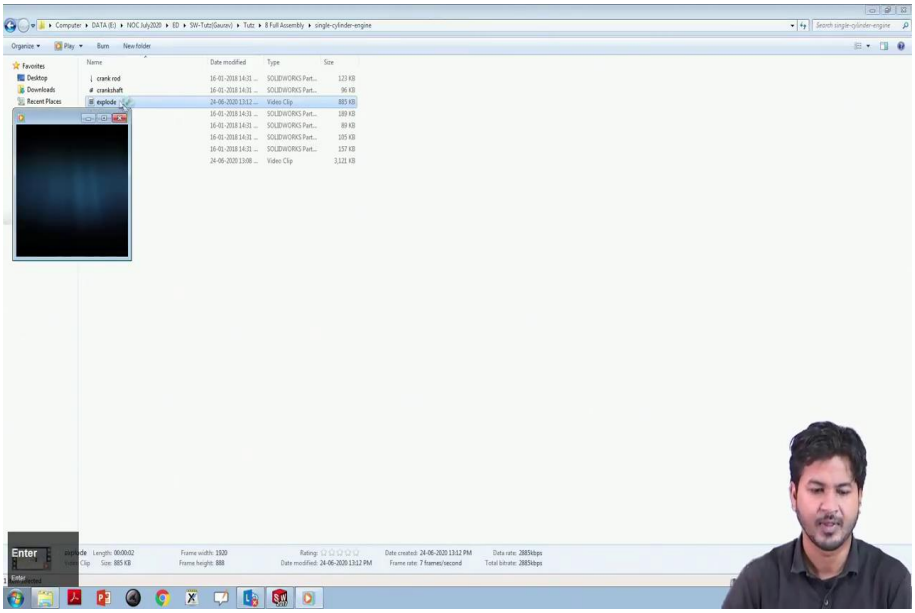


(Refer Slide Time: 23:00)

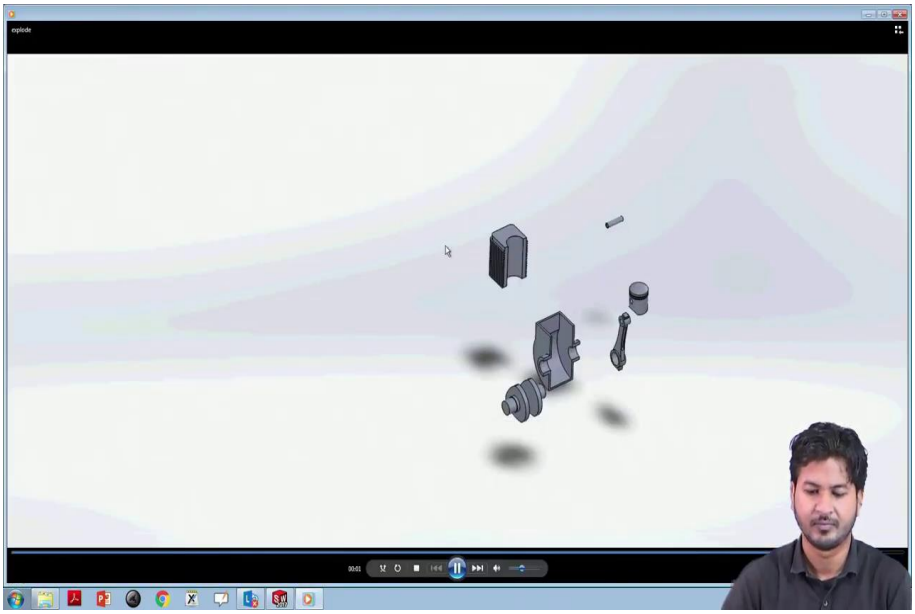


We will again simulate the graphics and we can see the file over here. This explodes, you can see this animation nicely.

(Refer Slide Time: 23:12)



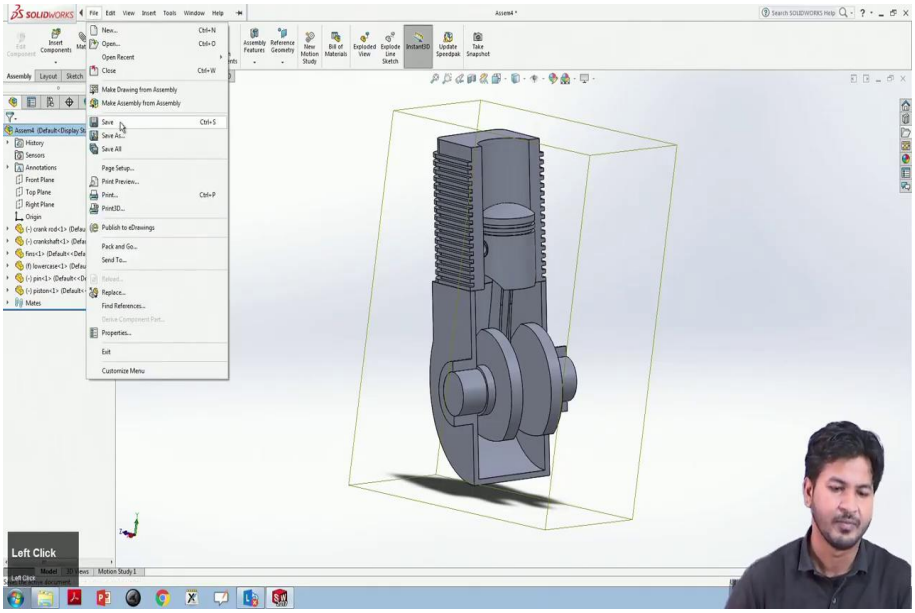
(Refer Slide Time: 23:15)



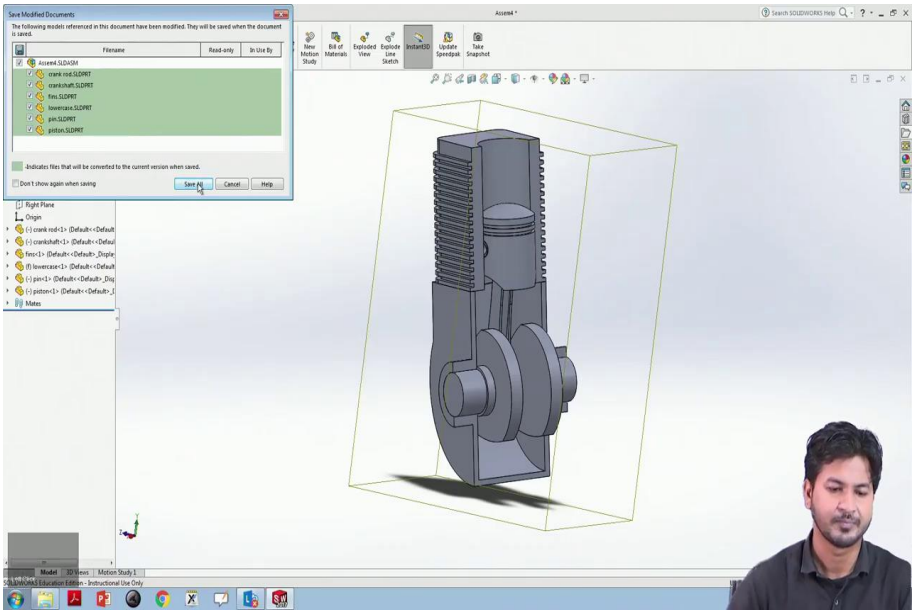
In the end, we have learned about basic, basic kinds of mating that are needed for the assembly of different parts for the product for product design.

So, one last thing that we need to know is to for saving of these assemblies.

(Refer Slide Time: 23:54)

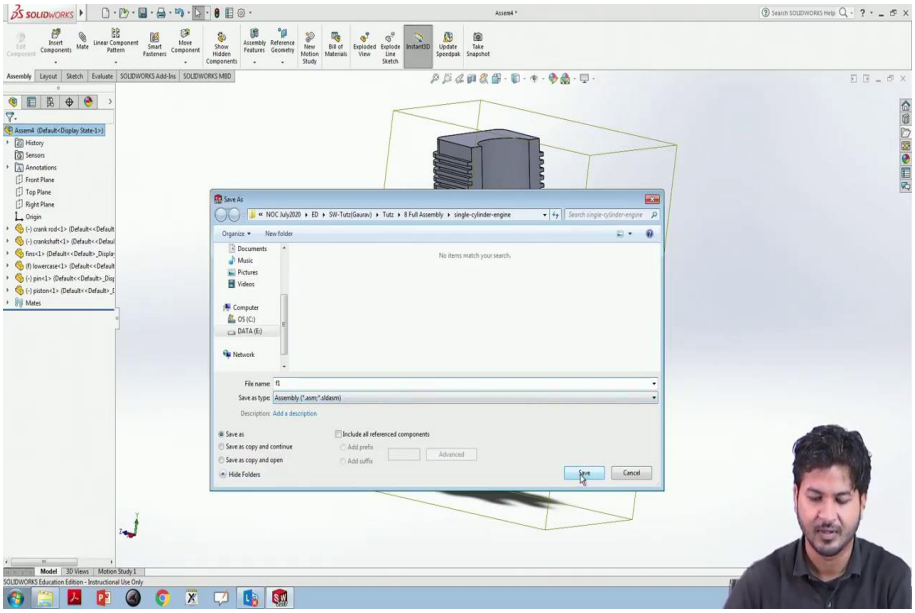


(Refer Slide Time: 23:58)



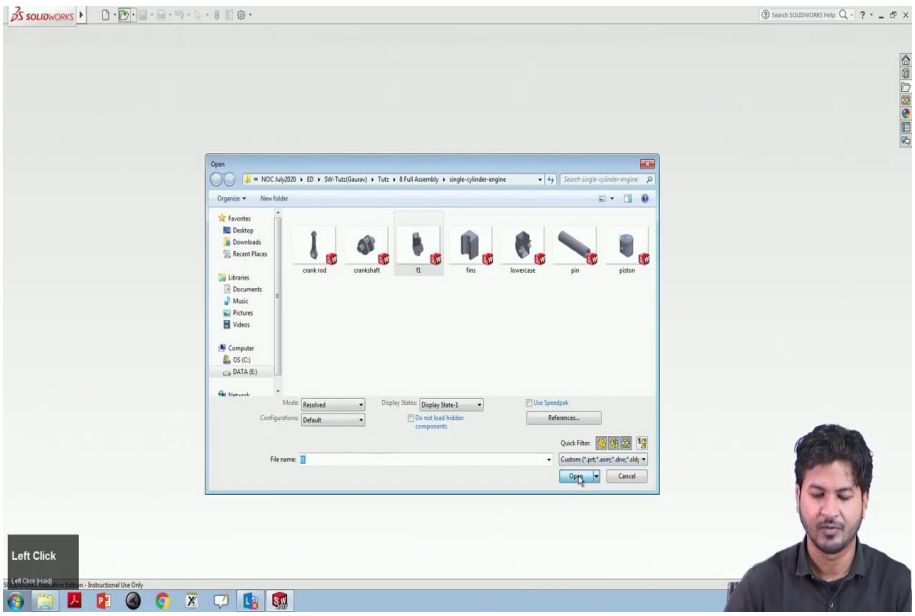
So, we will go to this file and marking it save asks, us for this.

(Refer Slide Time: 24:02)



Ask us for this some file name, we will mark it as f 1. And this saves us as dot asm. This dot asm file is the state of this assembly. We can check it again. We will close this.

(Refer Slide Time: 24:25)



And we will open that asm file that we just saved this f 1 we will click ok. So, now, whatever the operations we have performed earlier they are saved as a state, and we can see the everything as before. So, that we can play it on any other computer or we can lend it to someone, so some industry or anything.

So, here comes the end of this animation of here comes the end for this assembly process and their animation and motion study. So, this was a very basic introduction for this assembly and motion study.

So, thank you very much.