Engineering Graphics and Design
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Week 9: Part Modelling 1
Example 4

Welcome back. We are on week 9 on Part Modelling 1. In previous lecture we discussed about three tools used in the software to create solids which are the Revolve, Loft and the Pattern tools. In this lecture we will solve an example where we make use of these tools.

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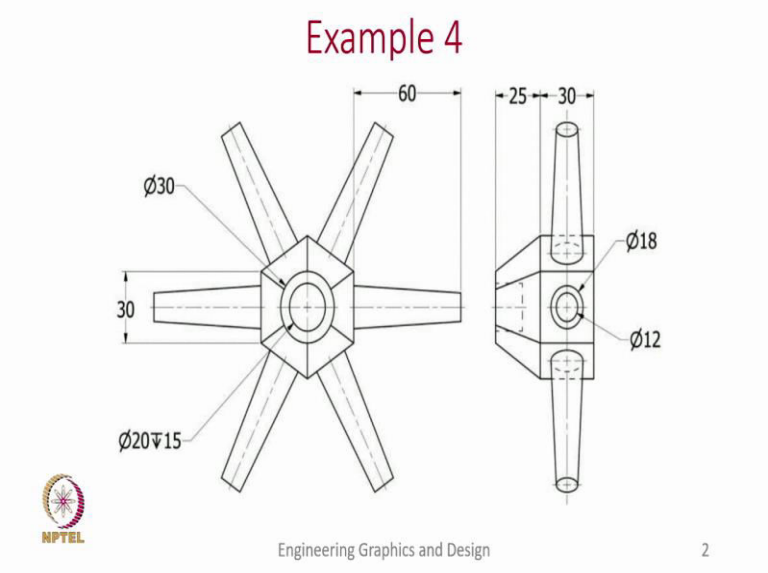

So here is an example where we see two views of it. Here we would be able to use the commands we have just learnt like the Loft and the Pattern. So, but let us first try to understand this solid so that it would be easy for us to develop it in the software.

First we see that it has two layers. The bottom layer here is in the cross-section of a hexagon where we can extrude it for a distance of 30. And then from this top face of a hexagon there is a Loft command we need to use because the base of this solid is a hexagon but at the top it is a circle. The circle dimensions are given as diameter of 30. On the top face of it again there is a cavity, circular cavity. The diameter is 20 and for a depth of 15.

In addition to this we have these 6 wings. I called it as wings but essentially the cross-section of this is changing from a larger circle to a smaller circle. The dimensions are given here. The diameter of the larger circle or the larger cross-section is 18 and the diameter of the smaller

cross-section is 12. So as it moves out from the center of the object the cross-section decreases from diameter 18 to diameter 12. And the total length of it is 60. So let us get started and see how we can use different tools we have been learning till now.

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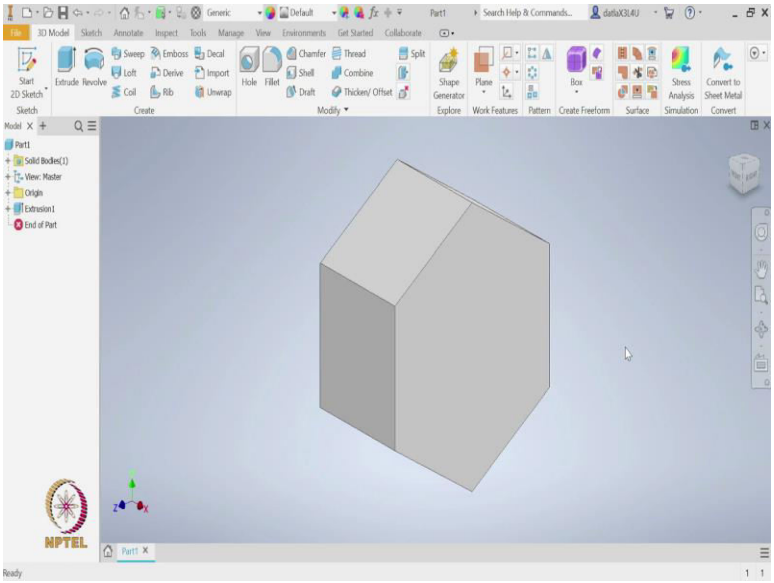

So we are at the initial interface. Let us start with the part template. Let us start with creating a 2D sketch. For the base we have seen that it is a hexagon. So let us first create that hexagon and later we can create the rest. So let me select any of these planes and create a hexagon. That I can create using this polygon of side 6. I will select the Origin and create a hexagon.

First let us select one of the features and say it is horizontal. So I will select the Horizontal constraint and select this edge. It maintains this as horizontal. Though here it may not be horizontal because we are talking about Y Z constraint. But essentially it looks like a hexagon. So let us continue with it. And we were also mentioned that each side is 30. Select all. And let us Zoom In. Now it is completely constrained. Let us finish sketch. Extrude for 30 mm. Here is the hexagonal base we planned to model.

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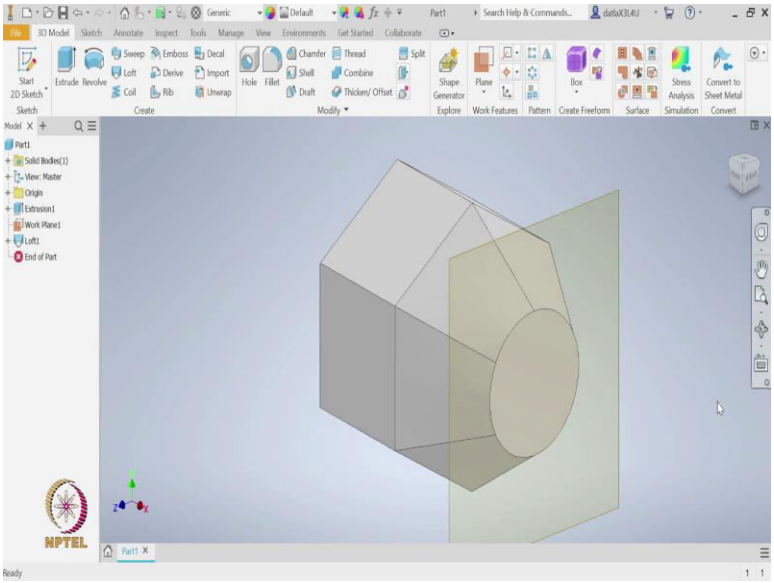

So now let us going back to the question. We see we need to create another plane which is 25 on top of the hexagonal part where we create a circle. So first let us create a plane using the offset from Plane option. We will select the top face and say that this is at a distance of 25.

So once we have selected, created a plane we can go to again Start 2D Sketch, select this plane and draw a circle. We will start with the origin. And the diameter is given as, the larger diameter is 30. So now it is completely constrained. Let us finish the sketch. And now by using the Loft tool we can connect the hexagonal face. We can connect this hexagonal face with the top circle. Then we create this solid using the Loft tool.

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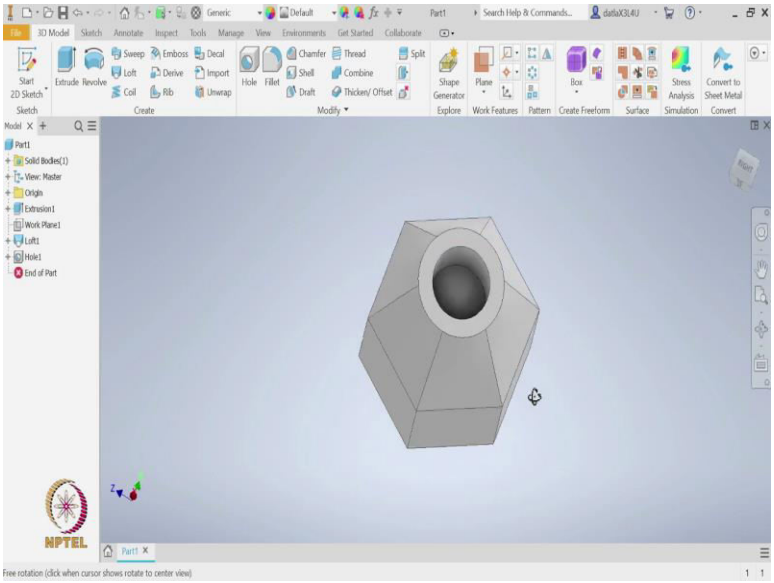

So now going back to the question we see we need to create this cavity which is of diameter 20 and the depth of 15. For this I can directly use this Hole tool. So I need to select the top face and mention the diameter to be 20. And let us make it concentric with the top face and let us specify the depth using the by Termination by Distance. We will use the flat drill point and the depth is 50. So with this we are able to create the part. Let us select all and let us make this top face invisible. So I will uncheck the visibility. Now you have this feature.

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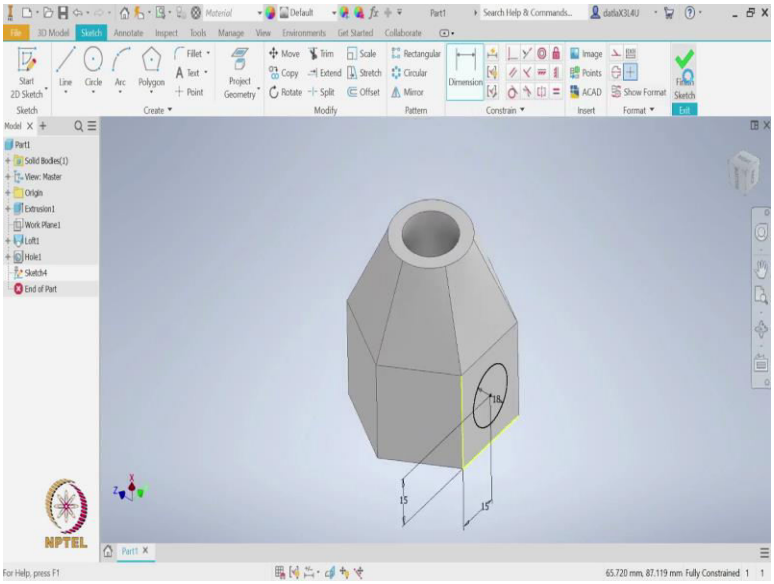

Lastly what is remaining are those 6 wings we were talking about. To create it we will use the Revolve Pattern command. But before doing that we need to create this feature of a decreasing cross-section from 18 diameter to 12 diameter. So for this again let us pick a Start a Sketch by picking one of these six hexagonal planes. And we now need to create a larger cross-section diameter of 18. Let us specify the dimensions. This from one edge should be half of it which is 15, already given. And in the other direction too, it is 15. Now it is completely constrained. Let us finish the sketch.

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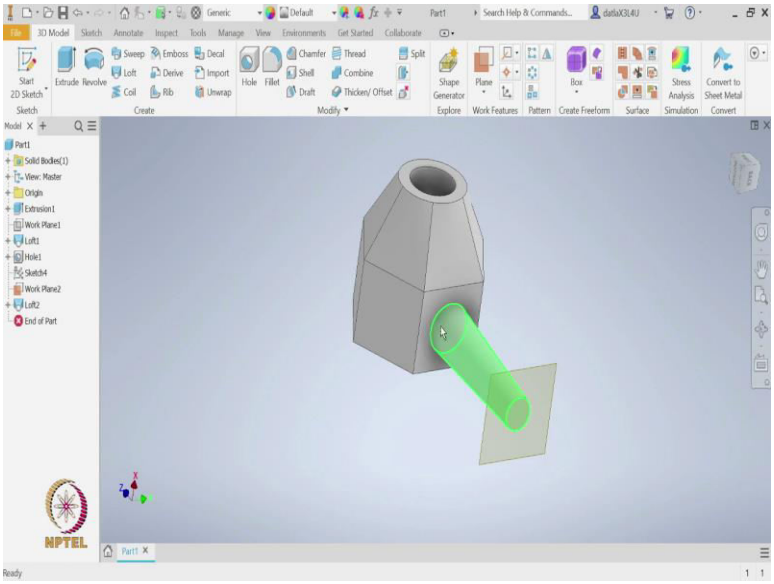

Now what we need to do is we need to create a plane at a distance of 60. So here it is mentioned that the length of this tapered cross-section is 60. So for that we will first create a plane at a distance of 60, and on that we will create a circle. So first let us go to the plane. Let us use this Offset from Plane, and select the one plane of this. so we will select this to be 60.

Now I will create a sketch on the newly created plane. We said we want to create a circle. So once I want to create a circle now I notice that I am not able to see the center point. For that what I can do is I can use the Project Geometry option. Once I go to Project Geometry I can project this center point on the larger diameter circle on to this plane. Probably you can see now,. So it has projected a point on the plane we are working at. So now let us create a circle using this projected point with a diameter of 12. Let us finish the sketch.

And now let us use the Loft command. So once we use the Loft tool we need to select the two profiles. This is profile 1. And profile 2 either I can directly select here or I can go to the browser and select the second profile. So now we have created this reducing or the tapered feature.

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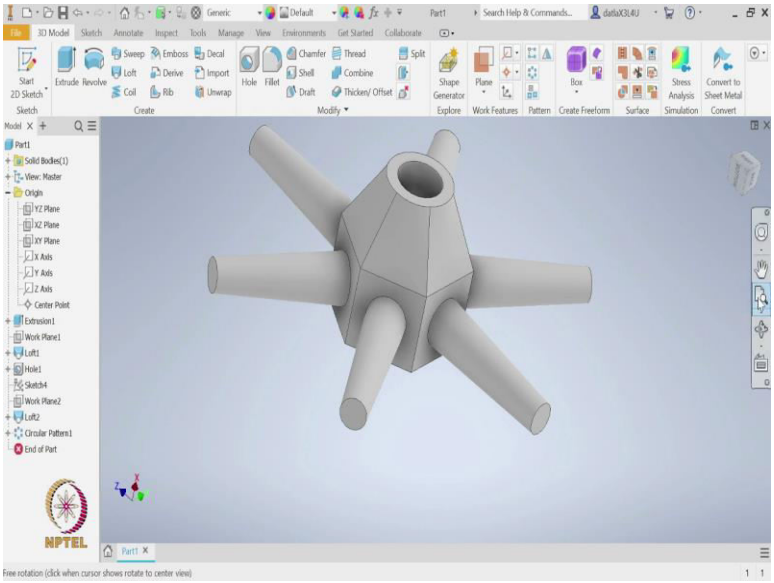

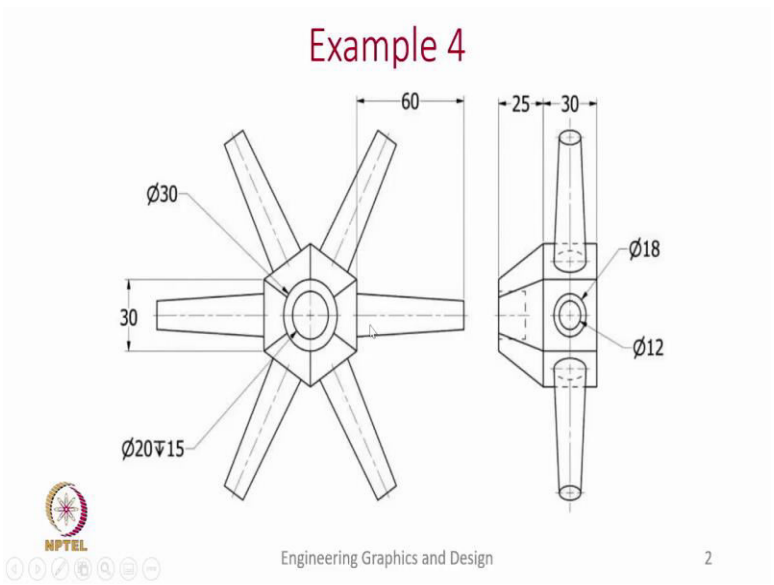

What is remaining is to duplicate this 6 times using the Revolve Circular Pattern option. So we will first select the feature, and then we need to specify the rotation axis. So how do we specify the rotation axis? Either I can go this Origin and then specify the X axis. That is one way. The other way is I can select any of the circles which has the same. So if I select, let us say this Circle feature, the axis of it will do the Circular pattern. So it has selected the axis which is coincident

with the X axis. We have options like do we want 6 duplicates? In this example, yes, we want 6 duplicates and the angle as 360. And let us click Ok to finish the object.

So with this we have concluded this problem. Of course I can turn off the visibility of this plane and then you see the complete feature what we are asked in this question. So with this, we conclude this lecture. We will look at one more example in the next lecture. Thank you for your attention.