Engineering Graphics and Design
Professor Naresh V. Datla
Department of Mechanical Engineering
Indian Institute of Technology, Delhi
Week 11: Assembly
Example 8

Welcome back. In this lecture we will solve an assembly problem using the AutoCAD inventor software. So, let us get to the problem.

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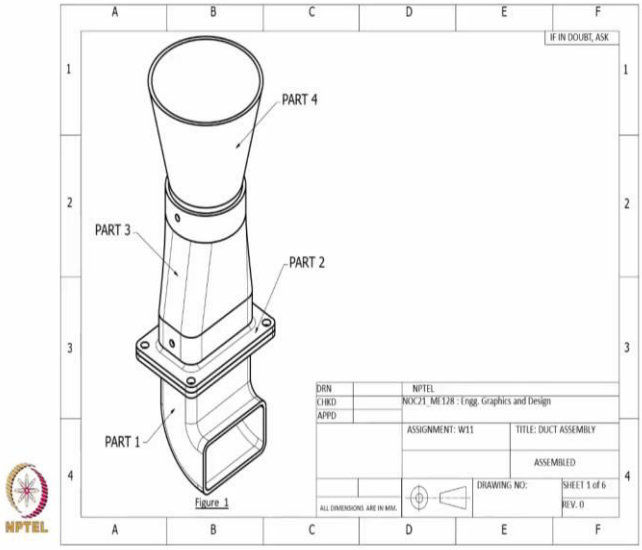

Here is a duct assembly which has four parts. So, first we will try to understand the problem and then go into the software to see how to assemble this. So, first we see that there are four parts. Starting with the bottom part which is like an L-shape and the second part sits right on top of the first part. And third part and fourth part you see that the axis of it are all vertical and they align together. So, essentially all these four parts are sitting one on top of each other.

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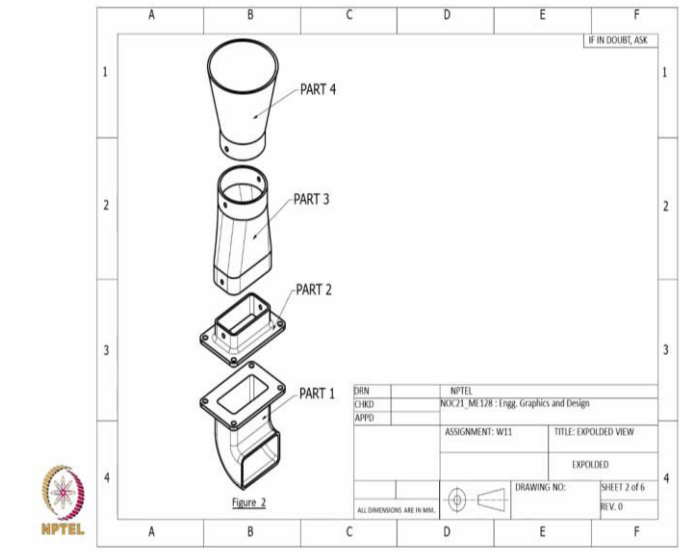

So, we also have an exploded view to give us a clear idea about how we are assembling these four parts. So, as we already mentioned, these all come close to each other and they are all aligned in one vertical axis. So, we also have the part drawings of the each of these parts.

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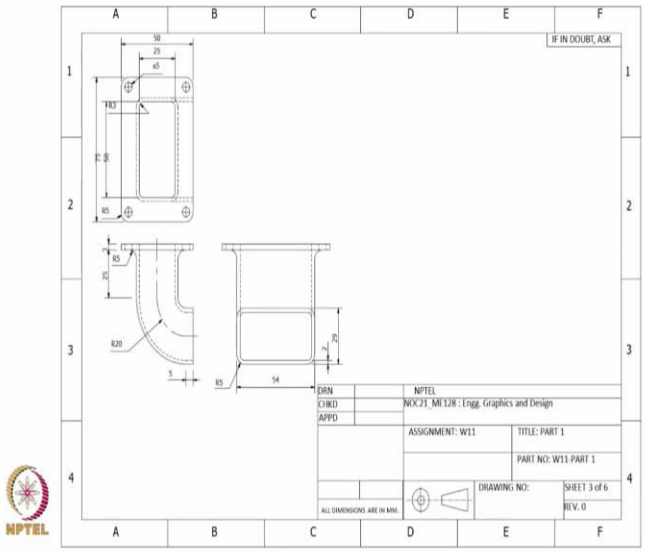

Starting with, this is part one which is the bottom most part.

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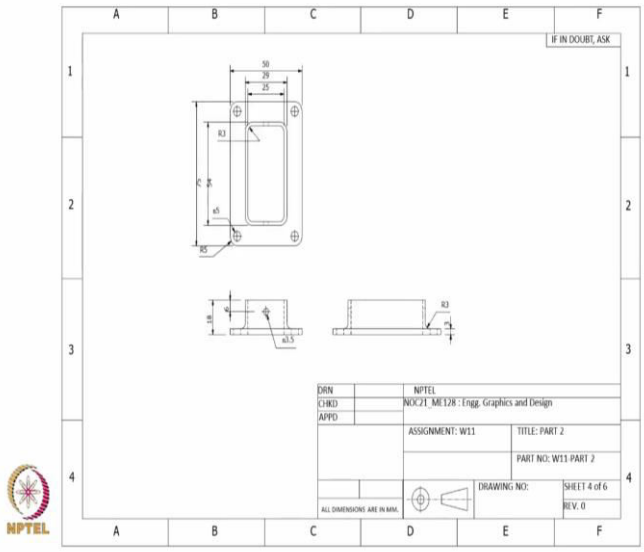

Second is part two which is in between this part one at the bottom and part three at the middle.

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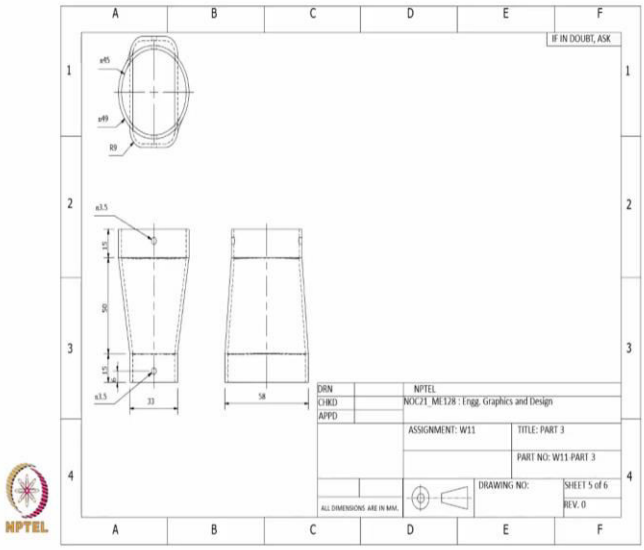

Next is part three which is again on top of parts one and two. So, it is second from the, coming from the top.

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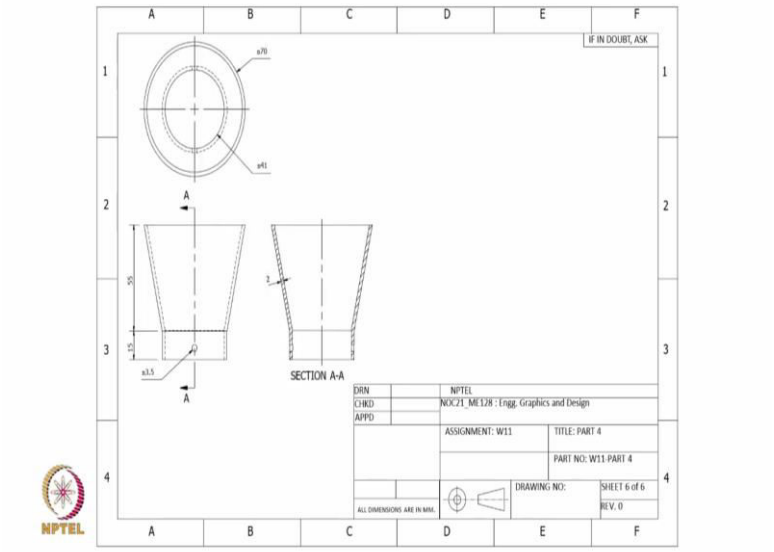

And lastly, we have this part four which is sitting on top of all the three parts. The reason why we are showing all these four parts is, so that you can pause this video and spend some time in developing these parts.

For me I have already created these parts, so that I thought I will save some time. When we can focus more time on assembling these parts. So let us get back to the question. And now I will move to the software to see how we assemble this into a assembly.

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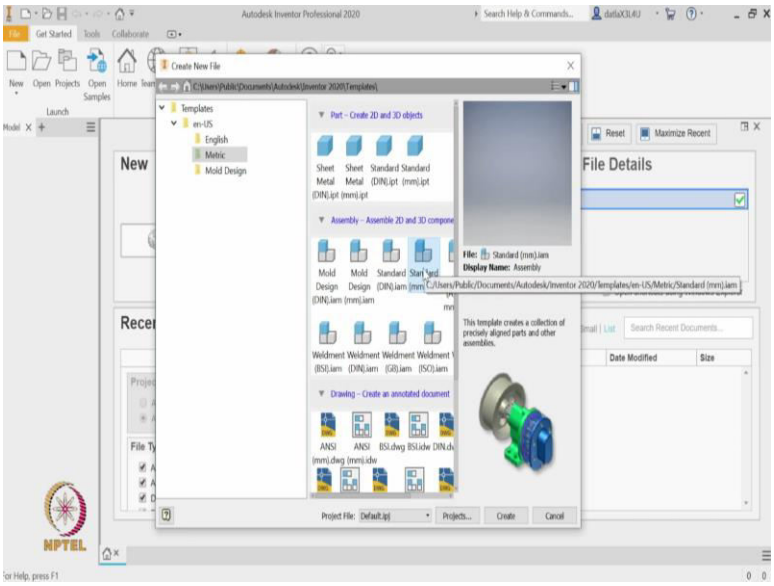

So here we are at the initial interface of the software. Let us open a template assembly template standard (mm).iam.

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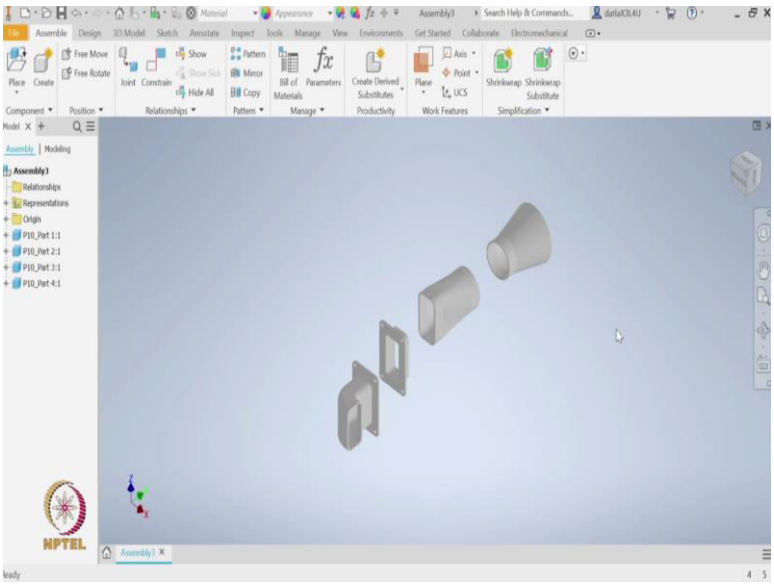

We will be following the bottom-up approach. Where we have already created the part models. We need to bring them into the assembly environment. So, for that we go with this place tool and select these four parts, parts one to four and select open. So let us place these here and right click and say ok. Since we are only looking at one component of each.

So, these are the four components we have. First thing we need to do is one of these components we need to ground it such that we restrict all the degrees of freedom for one component. And later one at a time we will move into each of these other three components to constrain them.

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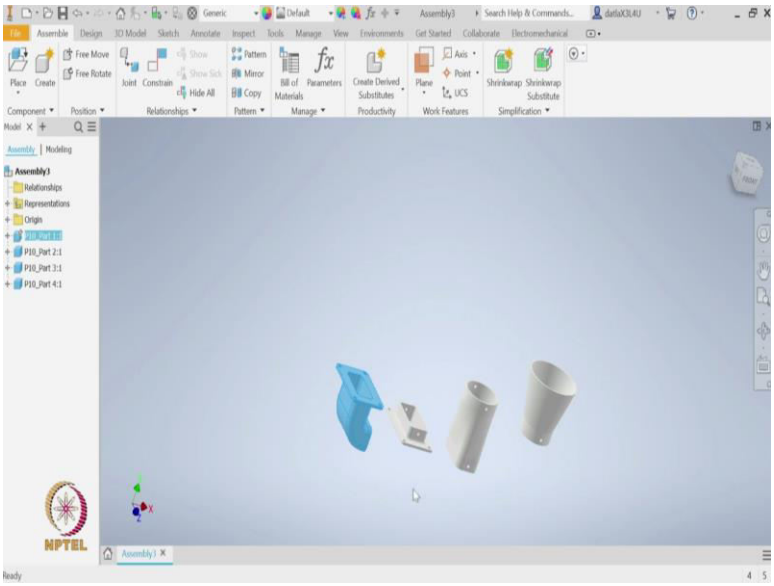

So, I am choosing the bottom part one. Right click and say grounded. So, now I have the part one which is grounded or constrained. Now let us get started with part two such that it is properly aligned with the part one.

So, we will mate this top surface of the part one and the bottom surface of part two, apply. And then, now to bring this part two close to part one and to align it I will use the flush. Where I will select this face and this face. And apply the constrain. We still see it is not properly aligned because then we need to use one more flush between this face and this face.

Now, it is properly aligned, we are done. So, we need to apply the constraint and then it is the part two is properly aligned with part one. So, we can go to the degrees of freedom analysis and check that both part one and part two are completely constrained.

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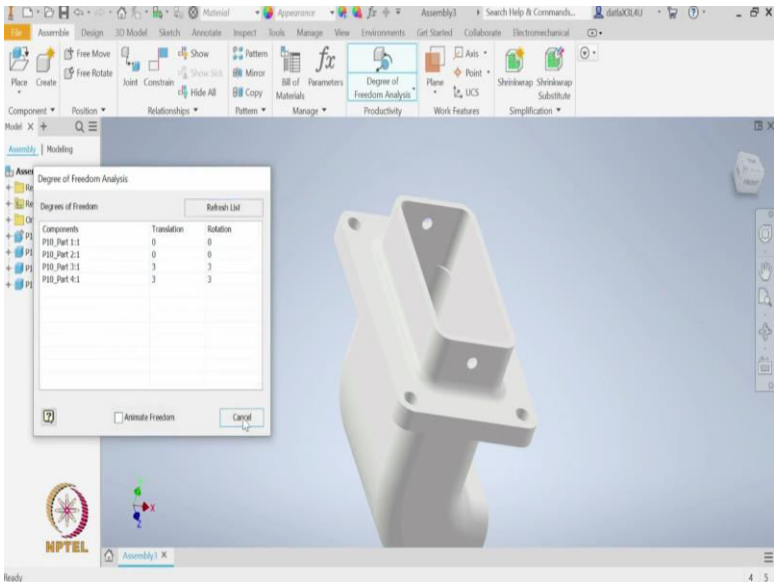

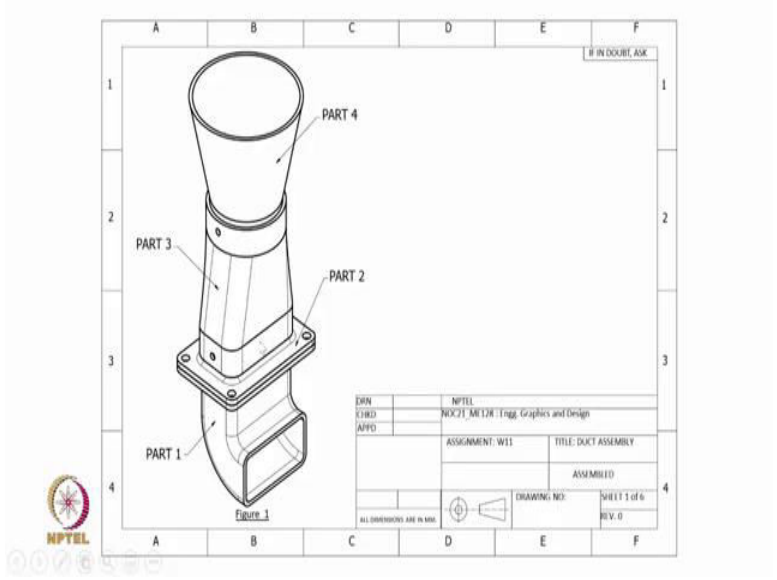

So, now we can move into part three and four. So, what I will do is just to have a good contrast let me change the, select part three and change the colour. So, we will move this close and try to understand how to constrain this part three with respect to parts one and two.

So, for that let us go back to the problem. So, we notice that there are holes in this part three. these holes also match with the holes which are present in part two. So, we need to ensure that the axis of these pair of holes match between part two and three.

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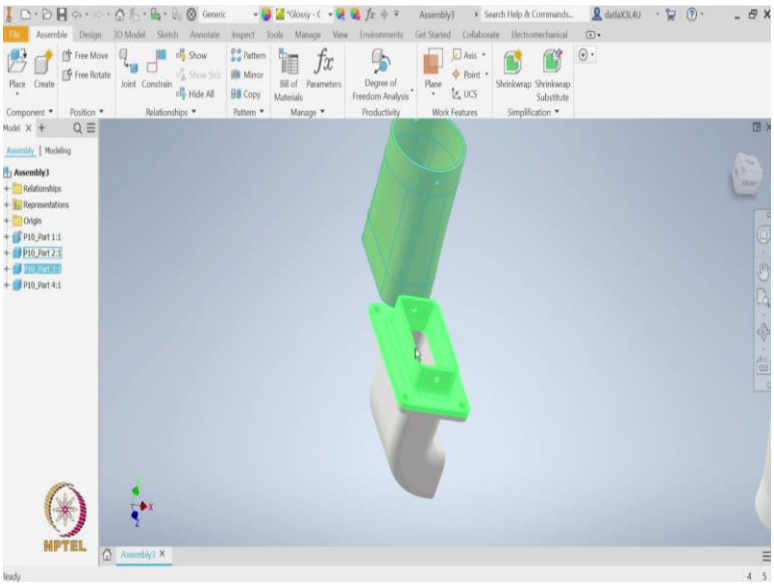

So let us look here these are the two matching holes which have an axis and similarly part three also have those matching holes which have an axis. So, we can go to constraint, choose that. So, I have chosen the first axis from part two and then second axis from part three. So, it is showing a preview of how it will align both these axises. Which looks fine, let us apply. So, now we see that I can move this along the common axis. It has two degrees of freedom. One is the translation and the other is this floatation.

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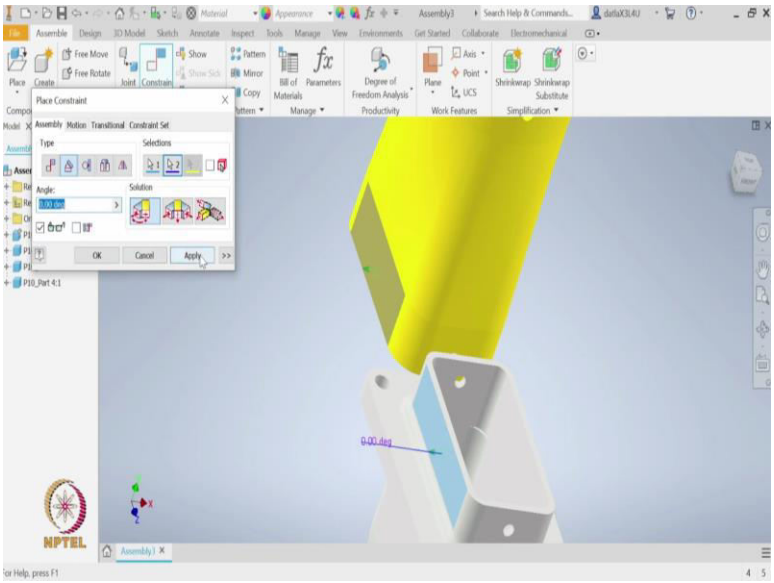

So how do we constrain this? So, for that what we can do is we can define the angle between, let us say this face of part two and this vertical face of part three. So, we will go to constraint, define the angle using directed angle. So, I will choose this face from part two and this face from part three. Now both of them we are seeing they are parallel to each other because the angle is zero. So, let us apply the constraint.

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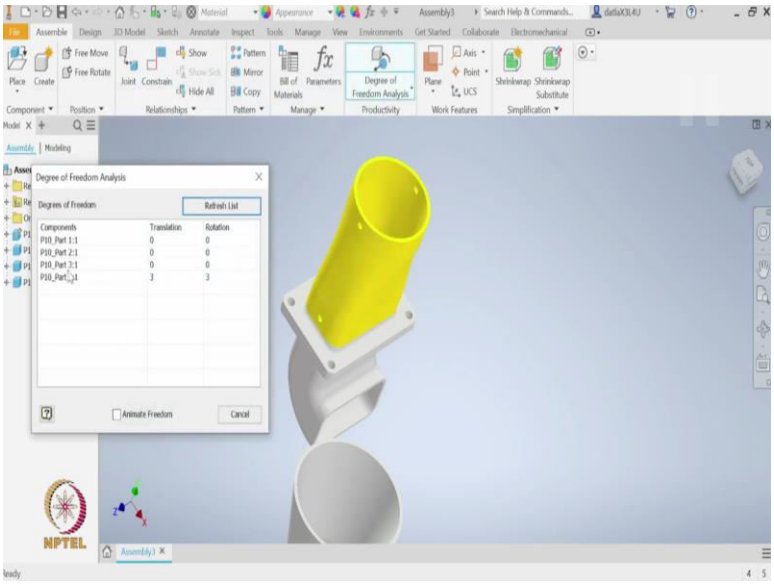

Similarly, I will do the, similar zero-degree angle between this face of part two and this face of part three. So, let me select face one, face two and apply. So, now it is vertical. Lastly what I need to do is? I need to mate this face of part two with the interior of this part three. So, let us select this face from part two and the interior of part three. Let us zoom in. And apply. So, now we see this part three is properly aligned with parts one and two. So, we can go and check the degrees of freedoms. We notice that for part three all degrees of freedom are constrained.

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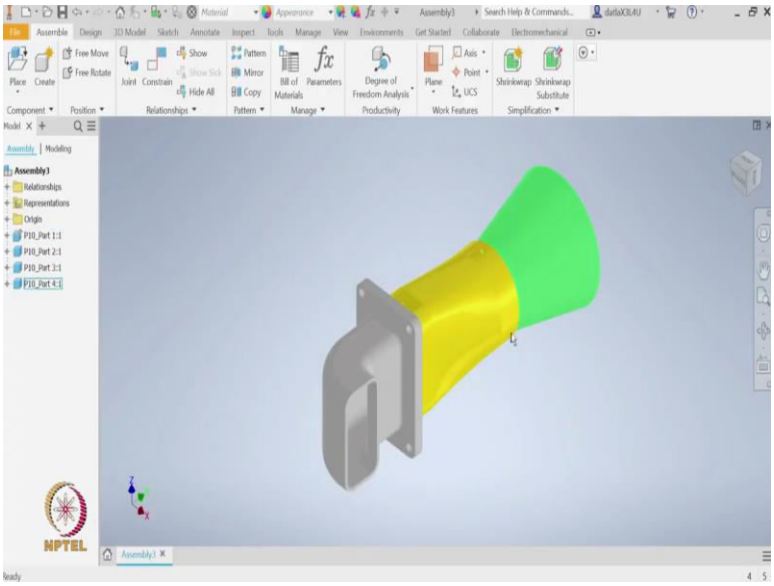

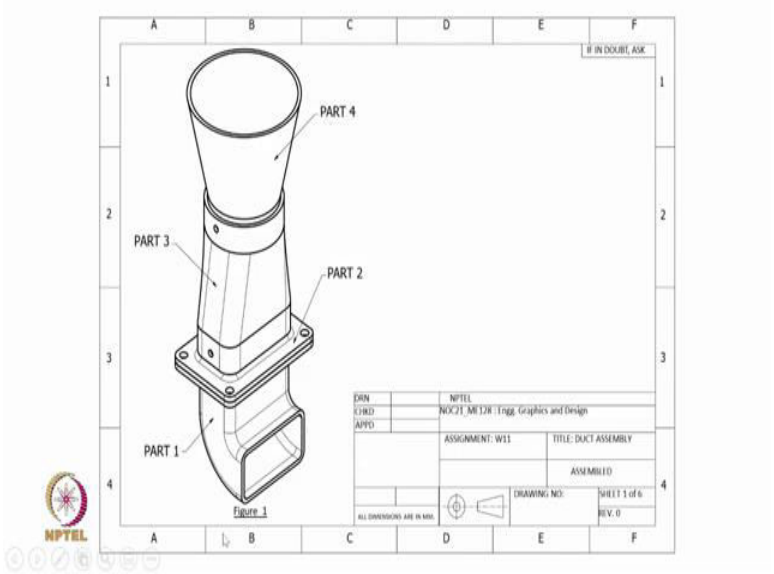

Lastly, regarding part four again what we will do is we notice that there are again this pair of holes in part three and this pair of holes in part four. If we align both the axises we can constrain couple of degrees of freedom. So, first let us go to constraint, we are in mate, let us select this axis from part three and similarly let us zoom in and select the axis from part four.

Now, we see that both these axes are aligned. Let us apply the constraint, but we still notice that the degree, part four will have few degrees of freedom, one is the translation and the other is the rotation. One way to constrain both is, we know that part four has an axis and part three has an axis, the vertical axis.

If we align those axes both these degrees of freedom will be constrained. So, for that let us again go to constraint, select the axis for part four and the axis for part three. So, once we constraint that and apply. We can go and check the degrees of freedom. Now we have constrained all parts, parts one to four in all degrees of freedom. So now we can go back to the question and see that, so the assembly which we are aiming to get it is exactly matching with what we have done. So, we can save this assembly.

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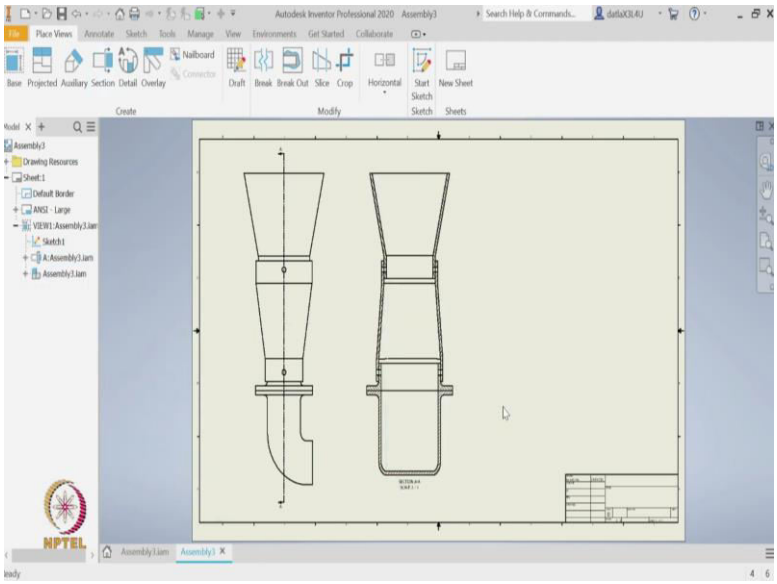

Let us say I will save it as an assembly three and then we can open a drawing template to extract the views of the assembly. So, first let us go to base since the assembly is already open it is selecting the previous one. Let us place it at the centre. And maybe we can go with enlarged scale. So let me keep it here.

So, now we have an extracted one view of this assembly. We can go for a section view by first selecting the base and then specifying the section line, right click, continue. So, we can place the section view here and done.

So, in this lecture we have started in the bottom-up approach where the four parts were already created. So, we imported those four parts into the assembly environment and then applied constraints to assemble all these four parts together. And after saving that assembly template we opened the drawing template and extracted a view as well as the section view. So, with this let us conclude the lecture. So, thank you for your attention.