Technical Arts 101
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Lecture - 19
TA 101
Think and Analyze

So, can I have 2 volunteers on stage please, can I have 2 volunteers on stage; you, you, yeah, stand here and stand there face the audience.

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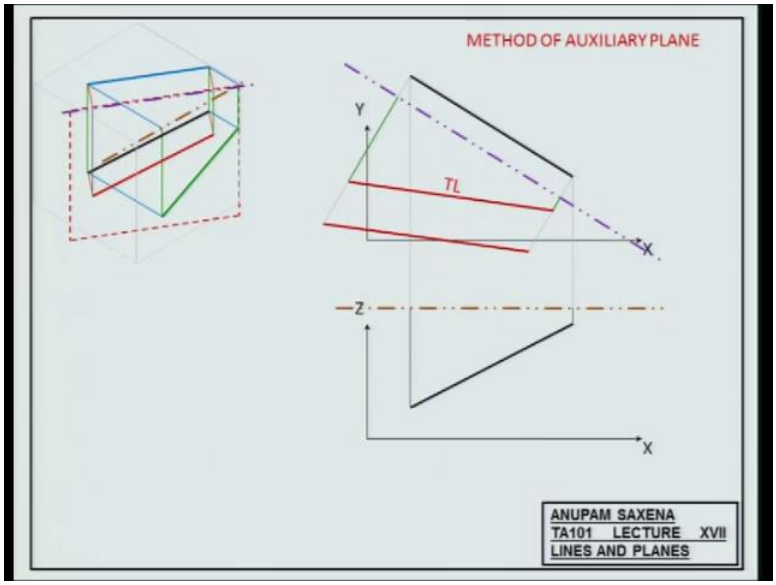

And, what you have is a 3 dimensional line in your hand and raise you are both hands and orient this line in any way you can; yeah, it is good now statue do same and statue. So, we were discussing the auxiliary method last time; so we were given a 3 dimension line of course, we are working with sketches on 2 dimensional paper. And, we essentially have the front projection or a projection of the 3 dimension line on a vertical plane and the horizontal plane. So, what is your name?

Student: Sidharth.

Sidharth, what is yours?

Student: Neeraj.

Neeraj. So, Sidharth and Neeraj are volunteers who are holding 2, 3 dimension lines in different ways; what you see is essentially the projection of Sidharth s line on the frontal plane and Neeraj s line on the frontal plane and imagine that this projection looks like this. And, if you get a chance to develop wings and if you tend to fly and if you tend to hit the roof; you would essentially be see the top view of these projections all right. So, that the question is how do I find the true length of these 3 dimension line; given the true projections which are what you see on this. So, what I have over here on the right is a little 3 dimensional box; where of course this projection all right. So, this projection is on the horizontal plane and this projection is on the vertical plane. And, if I extend the 2 projections, I would be in a position to get 3 dimension lines in a box all right; somebody ask me yesterday well I mean; what is the use of doing all that exercise that we have been doing, because we have been able to capture this line anyways within box ok.

So, the answer to that is well, have you actually captured, can you actually see that 3 dimensional line? No, although the box is something that you can see is still visible on a 2 dimensional vertical plane right it is not help; anyhow, what do we do? So, the idea is for so maybe I will probably need one more can you come? Yeah, purple T shirt yeah the g c. Turn around hold on number 5; yeah I do not know your names I am sorry as much as I would want to know your names.

So, stand in front of Neeraj; so Shashwath and Shivam are able to see the frontal projections of these 3 dimensional lines. Now, what they would do is together 2 picture of the line they would try to reorient themselves. Now, can you try to reorient themselves; so that you can see the actual 3 dimension line yeah you are ok; can you can you see that? No, can you? Yeah now can you see, how about you? No, no, no; you have to yeah, what have they done? If you look at that red plane over there they essentially oriented themselves to be parallel to that plane ok is it not, that is it not that true Shivam yeah.

Now, once they have oriented themselves to stay parallel to the plane on which or on a plane parallel to which that projection lies. And, therefore the actual 3 dimensional line lies once you have capture that plane; all you need to do is draw hinge line and flip that plane over as simple was there, everybody with me here, can I over yeah over statue ok clear. Now, stay with me here this is important; so that red plane is actually a plane that

is parallel to another plane which is containing this projection as well as this actual 3 dimensional line.

So, once you have captured both of these all you need to do is flip that plane over like you do in case of orthographic projections. So, these distances are the same because that red plane is parallel so you have. And, then what would this distance be, would it be the same as this distance great; how about this one? This same as this distance right; all you need to do is now figure out. So, this is true line that you have captured on the plane figure out the hinge lines and flip this red; what we call the auxiliary plane over ok as far as visualization goes they should be now clear to you. You know wait I am running behind in schedule and need to do this. Because otherwise you have problems with your next lab; so I need to do this. So, extra class Friday 12 to l, date 17 feel free; if you come great I will be there, if you do not want to come fine. So, what we will do now is we will flip this plane over with respect to this horizontal plane; this is the hinge line that separates the vertical plane from the horizontal plane that is the blue line stay with me.

Now, if you notice this purple hinge line this one has to be parallel to the projection in the horizontal plane ok right, yeah. And, of course the projections are going to be perpendicular to the hinge line. Now, pay attention to this distance we are trying to flip this plane over. So, what would this distance be over here? So, should I be measuring this here or here, here ok. And, likewise the small of green distanced I measure it there, I have this green line capture sorry, red line capture there. So, essentially what I have done is I have rotated this red plane about the hinge line maintaining these 2 distances as this and this. And, I have the true length of the line on the auxiliary plane; do you agree, do you agree?

Student: ((Refer Time: 10:42))

Good, the easier way to remember this is why this, how I remember you essentially have 3 views of the line the frontal view, the top view and the auxiliary view; which view is common; the frontal, the top, the auxiliary?

Student: The auxiliary.

Sorry, the top view is common. So, this one is common between this view and this view ok. Now, just in case if you are confused where it takes the distances from this would

help; just let go of the common view, measure the distance in one of the given views and transfer that distance in the third view as simple as that. Now, let us see if you can exercise this in a slightly different manner. Now, I really do not need to have the auxiliary plane associated with the horizontal plane; I can have this associated with the vertical plane as well this is. Of course, in true length hinge line that separates the front from the horizontal or the top; this is something that we have seen it does not really matter; where the distance of that hinge line is from the projection will essentially be getting the same true length of that line ok; this was the line that was parallel to the line from the.

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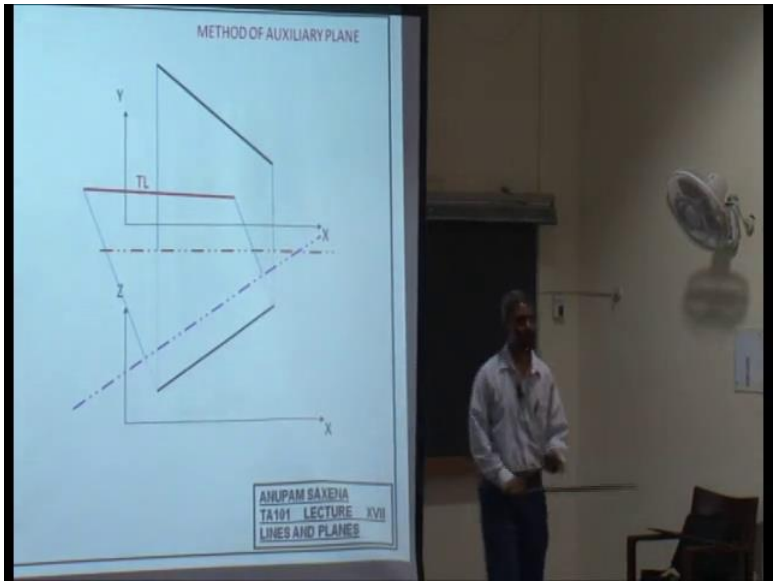

Now, hinge line. Now, instead of drawing a hinge line which is parallel to the projection in the horizontal plane; I am going to draw my hinge line over here same concept. Then, what how the projections come out perpendicular from which view horizontal or vertical like this. Now, this view is going to be common between this view and the auxiliary view; where I going to be measuring the distances from the horizontal. So, you would measure this distance there. And, these distances have to be from the hinge line. So, you would measuring that distance over there and transferring that distances where left projection or right projection.

Student: ((Refer Time: 13:45)).

This one; again, this would be measured from this hinge line, measure that distance in the horizontal plane again from the hinge line and transfer it over there and you have the true length. Now, if you go back to your method of rotation and if you go even further back; I had introduce certain formula right. So, if one of the projections is horizontal or rather parallel to the hinge line; then the other projection is going to be giving the true length of the line right; do you see something very similar over here; this projection is parallel to this hinge line. And, therefore the other projection will be giving true length of this 3 dimension line, and this going to be true in case of auxiliary plane as well right with me all right.

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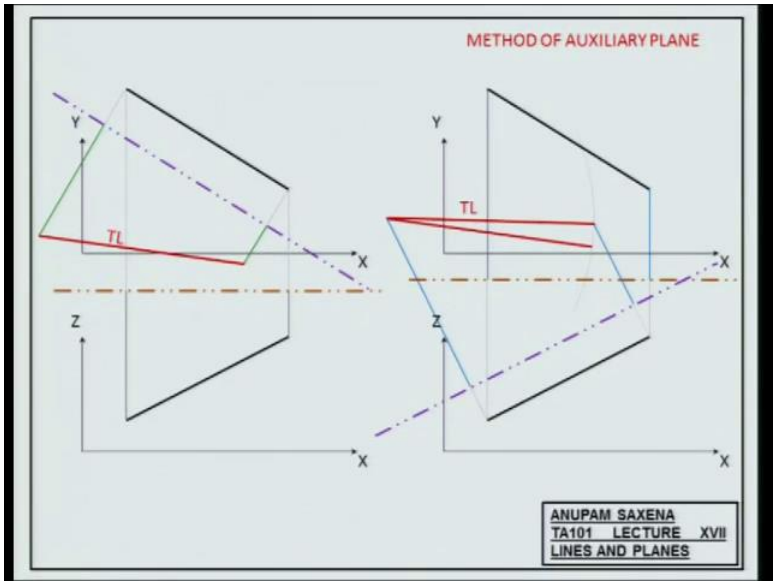

Now, in this one we had taken the auxiliary plane from the top view, the vertical plane. And, the other example we had done the same thing from the horizontal; sorry from the vertical plane or from the front view; they both give you the true lengths of the line. Are you convinced would the length be the same or would be different?

Student: ((Refer Time: 14:23)).

Same just in case if you are not; if I transfer this line over there and draw an arc it is conforms. So, whether you see top view or the front view draw the auxiliary plane from there get the true length will be the same so far with me.

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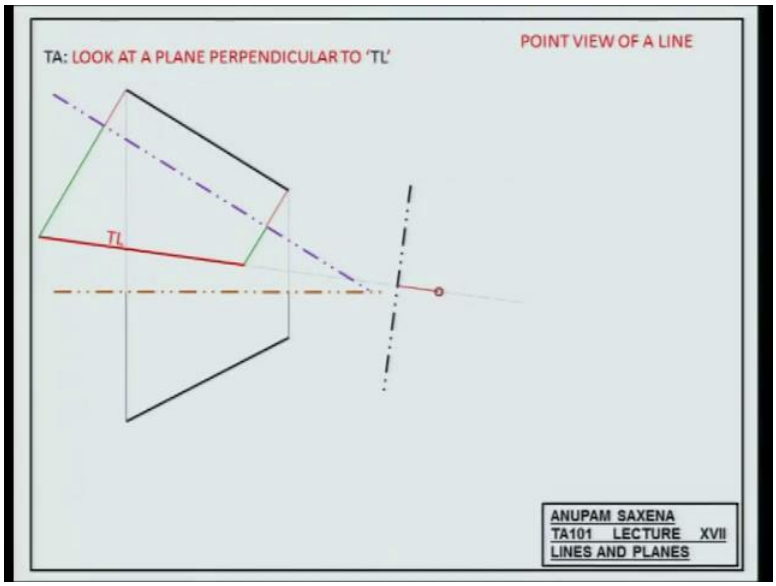

Now, Shivam choose any orientation stand somewhere all right. The first thing [f 1] did

Student: Shivam.

Shivam did was to orient them self in such a way that he captured a plane on which the actual 3 dimension was there to get the true length. Now, the question is if I want to get the point of view of a line, in other words if I want to orient myself to a plane where I can see the point corresponding to this line what would I do?

Student: ((Refer Time: 16:55)).

Yeah, yeah; how would you see the line as a point? Yeah statue, stay here that is how precisely, that is how. So, he looking at or he is on a plane which is? So, he is on a plane which is perpendicular at the line. So, I have a plane where I capture this line in true length. Now, I have to look at this line from a direction perpendicular to it; for that what do I need to do? If I want to draw hinge line and flip that plane over where would my hinge line be? I have this guy in true length; if I want to get the point view of this where would my hinge line be perpendicular to this? Yeah ok. And, the same concept of transferring distances. Now, this view becomes common between this view and the view that we are going to draw right. And, we are going to be transferring distances from where to where from the top view to the second auxiliary view, this first auxiliary, view this is the second auxiliary view.

And, do you now kind of see whether we are going to be getting a point, there will be a single projection here like there. And, they are going to be measuring distances from the top view and these distances they will be the same. And, I need to transfer that distances over there and essentially I will be seeing the point view of a line agreed? No.

Student: ((Refer Time: 19:46)).

Why not?

Student: ((Refer Time: 19:47)).

Ha.

Student: ((Refer Time: 19:54)).

This distance is the same as that distance; 3 views, 2 views are associated with a single view, drop that view take the distances from the first view transfer them to the third view. 3 views 1, 2 and 3 this view is common between this. And, this drop this view take the distances from here and transfer it over here.

Student: ((Refer Time: 20:33)).

Yeah.

Student: ((Refer Time: 20:37)).

Lost.

Student: Yes sir.

Now, do you agree that if I draw a hinge line perpendicular to the true length view of the line here? And, if I take a projection here somewhere over here I will be seeing the point view of the line do you agree with that?

Student: Yes, sir.

All right; where would that point lying where would that point lie, where would it lie? I mean you are following the same steps right; you are creating another auxiliary plane point you. So, the principle that we are learnt from before of transferring distances you

are going to transferring distances from this view to this view right; where is this point? Take this distances transfer it over there same principles right, questions?

Student: Sir, Can you go back to the pokes diagram and show weather the black line lie on the red.

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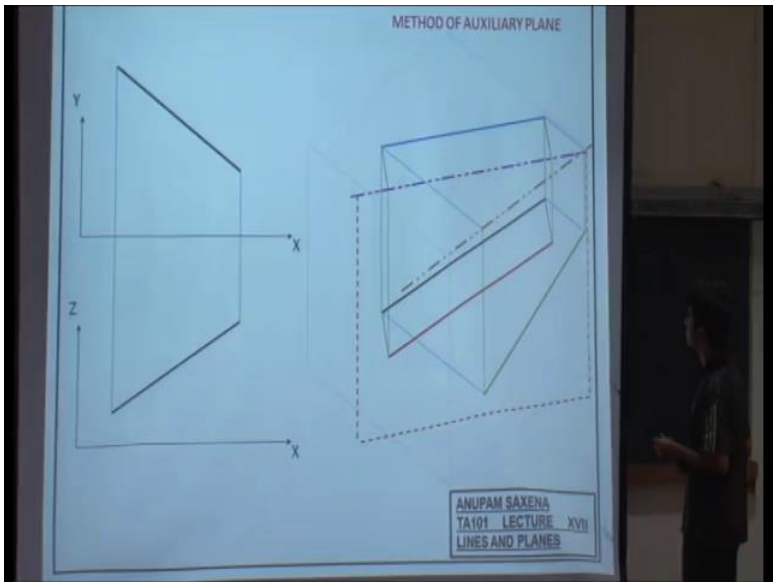

There can you come here; well, you have to see for yourself take this go over there. So, the red line which is the true length of a line; that lies on the red plane this one absolutely. So, if you want to get the point view of this line.

Student: ((Refer Time: 22:55)).

Absolutely.

Student: ((Refer Time: 23:02)).

Absolutely, so…

Student: ((Refer Time: 23:05)).

Ok.

Student: ((Refer Time: 23:08)).

So, your black hinge line will be perpendicular to this one.

Student: ((Refer Time: 23:19)).

Yeah; rather it would be lying on the plane which is perpendicular of this.

Student: Hoho.

Would not it. So, if my plane that contains the true length is here how would orient to get the point view of this you will have to go perpendicular over there right.

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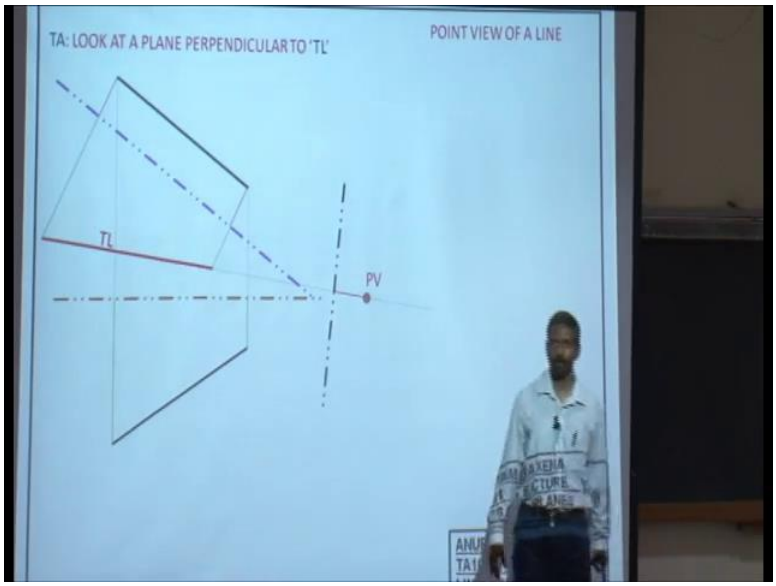

Let me see if I can explain this better; so as far is visualization goes. So, how would you, where are you? How would you describe this hinge line with respect to; let us say this hinge line. So, what you have done is you have flipped the auxiliary plane from this hinge line right. So, then your auxiliary plane was kind of here somewhere; you just kind of flipped it over right. Now, your this plane is kind of down here and you are flipping this out I guess. So, remember you are working everything on a 2 dimensional plane. So, when you flip, you transfer distances.

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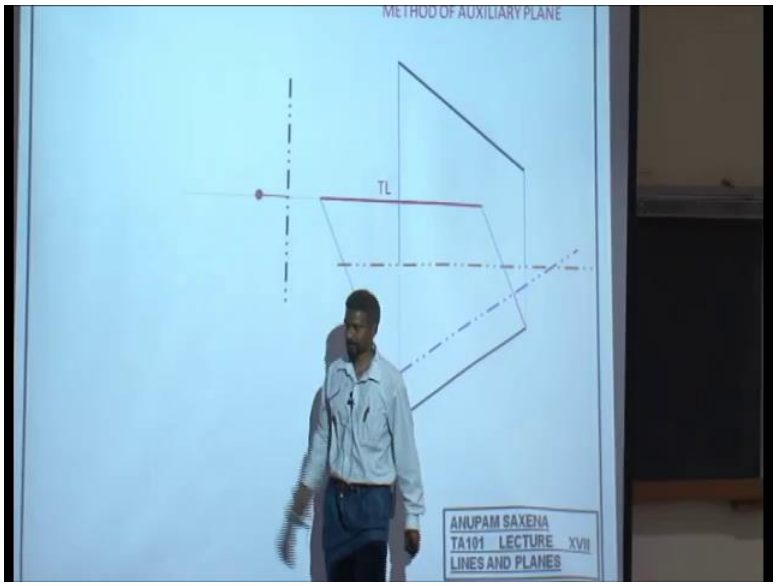

I can do the same thing from the other side. So, remember I had taken this hinge line over here; I had associated this auxiliary plane with the frontal plane; if I want to draw the point view of a line. Then, I have to figure a hinge line which is perpendicular to the T L line right; take a projection which is perpendicular to the hinge line and then transfer distances. Now, from where am I going to be transferring distances, from here? So, this distance is the same as this distance. So, if I transfer this distance over here; so this guy is sitting over here somewhere and this guy is just behind this guy ok. But the same distance from the hinge line; this is a point view think about this so this guy. So, these 2 points are one behind the other which one is closer to you; the one which is closer to the hinge line yeah; and this is right at the back. So, if you imagine that this is pretty much to like true length. And, if you kind of flip it like so you see this point. And, then you see this point exactly or precisely the behind this point this is what the point view is.

Student: ((Refer Time: 26:54)).

Yeah, with me or little lost.

Student: Completely lost.

Completely lost ok.

Student: ((Refer Time: 27:04)).

What is that?

Student: ((Refer Time: 27:12)).

I cannot here you I cannot here you.

Student: ((Refer Time: 27:23)).

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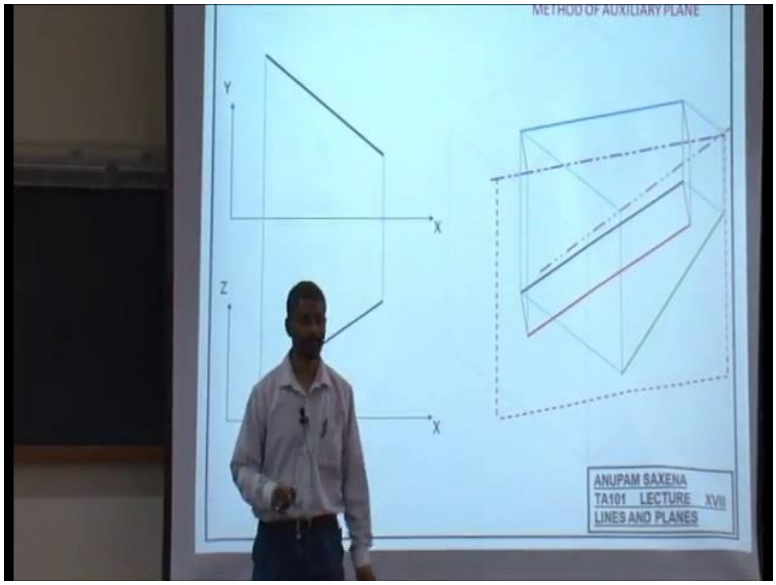

Why did we take this distance is same as this distance; this example you are true length is going to be lying on these projections; why are we taking this distance is same as this distance why, why?

Student: ((Refer Time: 28:08)).

Yeah. So, if you go back to that 3 dimensional box you will kind of make that relation right. So, those distances are they are going to be the same you do the same exercise and you will get your answer.

Student: which 2 planes intersect to get the black line?

Yeah; which 2 planes intersect to get the black line you have the answer right there; shift this plane back let it pass through the blue projection line over there. So, this plane will be containing the black line; so the blue line.

Student: ((Refer Time: 29:09)).

Oh, we will probably have to work out the cube for that perhaps, I will do that tomorrow. For now I just take my word for it why it should not be very difficult; I mean. So, once you have too loop line over here; imagine that is there on the frontal plane. Now, what you are going to be looking at a plane which is perpendicular of this line. And, then you are flipping that plane over on this plane you are going to see the point of view of the line; you are flipping this plane over same thing. But I will try to explain it better tomorrow; perhaps anyhow. So, if these not clear maybes take my word for it I will try to do a better job tomorrow; I was here somewhere yeah all right. So, just take my word for it. But you are essentially doing the same exercise of transferring distances it will come with practice.

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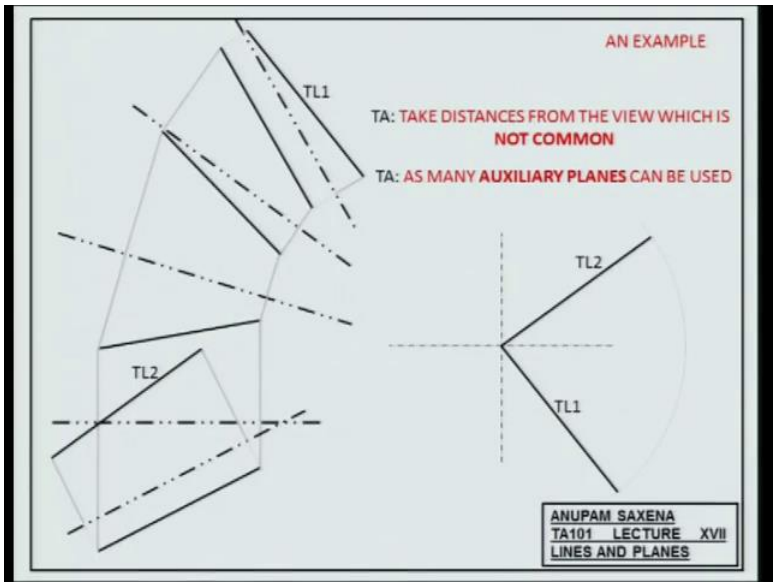

So, an example this is little difficult for you to understand. So, you have the projection on the frontal plane, you have the projection on the horizontal plane; front view, the top view. And, this something that you would need to keep in mind that of that 3 views just ignore the common view take distances from 1 and transfer them to the other. So, take distances from the view which is not common ok. For example this is the hinge line that separates these 2 projection maybe it will be a nice idea to sketch this while I am working with it you will probably better idea all right.

So, what will do I will draw some arbitrary hinge line somewhere here; stay with me here eyes on the screen please, what will do is will draw an arbitrary hinge line. I should be drawing this hinge line parallel to the projection; but I am trying to make a point. So, will draw this hinge line arbitrary; in a sense I am free to choose the auxiliary plane that I want I am frankly speaking. I can view that line or that projections from anywhere I want follow that rule take distances. So, this view is going to be common the distances are available from here. And, of course if I am viewing these 2 vertices my projection lines they have to be perpendicular to this hinge line right; I take the distances from below and transfer them over there; I get 1 vertex I take the distance from that vertices down there and transfer it over here. I get 2 vertices, I get a line ok.

Let me go forward will take another hinge line; again this is not parallel. Now, this guy is coming between the view that I am going to be making and this view. So, I am going to be taking the distances from this one over here; and transferring it over here. And, this time my projections are going to be parallel sorry; perpendicular to this hinge line like this; I take this distance transfer it over there, this distance transfer it over there; I get some other projection all right; just a so speak physical exercise, not even mental. Now, if I draw a line or a hinge line which is parallel to this projection do the same exercise.

Now, this time this view is common. So, will have to take the distances from here transfer them over there will take this distance yeah, this distance transfer it over there, that distance transfer it over there I will get this projection. Now, here notice that the hinge line is parallel to one of the projections. Therefore, you would expect this to be the true length of the line ok; what I did in one go over here; had I taken this hinge line to be parallel to this projection, I would have gotten the true length of the line immediately. But I prefer to take a few steps.

I ensure that these hinge lines they are not parallel to any of these intermediate projections; essentially I was free to choose the auxiliary plane that I wanted to I am just trying to make a point I will essentially be getting the true length of a line goes vertical and horizontal projections are given over here right. Now, let me call it T L 1 had I gone this, had I done this 1 step, had I made my hinge line parallel to one of these projections. Now, this view is common between this and the view that I am going to make I would be transferring this distance over here and this distance over here. I would expect this to be

the true length of the same line; because my hinge line is now parallel to this projection. Let me call it T L 2; 1 shot, multiple shots I should be getting same result is not it.

So, this is my T L 2, this is my T L1 same orientation T L 1, T L 2. And, if I let 1 of the vertices of these 2 lines go inside draw an arc I confirm that will be getting true length of line all right with me. So, what was initially a mental exercise now becomes a physical exercise; you can switch of your minds and you know draw these plane illusion yeah. So, the point was that I do not need to use just 1 auxiliary plane I can use as many auxiliary planes as I want. But of course that is not going to be efficient.

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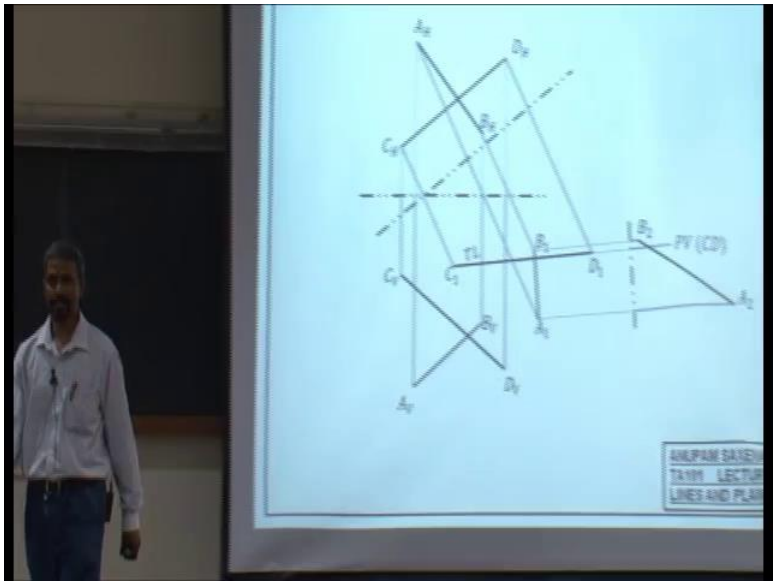

Anyhow, next one instead of 1 line; now, let us say we have 2 lines whose projections are given in the vertical and horizontal planes. Now, V the subscript V is for vertical the subscript H is for horizontal; 2 lines whose projections are given on the vertical plane and the horizontal plane. Question, do they intersect, do the actual lines intersect?

Student: They may or may not; how do you know?

They may or may not how do you know? And, how do you find that whether they intersect or not. 2 lines here; if they intersecting, if you happen to look at the point view or one of the lines that has to lie on the other line right. If you look at point view of 1 of the lines that has to lie on the other line right; if it does not then not intersecting. If the

point view of one of the lines is not on the other line that means that they are not intersecting ok.

Let us confirm hinge line follow these steps carefully; I choose to figure out the true length of C, D line C, D. And, that is the reason why I am going to be making in auxiliary plane; where this projection of series going to be parallel to this hinges line. I am focusing on C, D draw my projectors perpendicular to this hinge line this view is common. So, I measured distances from here transferred over here. Now, this is the projection where C would lie and this is the projection where D would lie which distance am I going to be taking this one; great transfer it there.

Now, I will take this distance and transfer it there this is C, D is this in true length.

Student: ((Refer Time: 39:54)).

Why?

Student: ((Refer Time: 39:57)).

Because one of it is projections this 1 is horizontal or is parallel to this hinge line. So, you would expect C 1, D 1 to be in true length ok. Now, to get the point of view of that you have to draw a hinge line which is perpendicular to this. But before that I have to transfer these 2 points as well; like just like C and D. So, my A, B they are going to be lying on these projectors; which are perpendicular, again to this hinge line this view is common. So, I measured distances from here transferred over here try take this distance, measure this over here this is my A 1. For example, I take that distance transferred over there that is my D 1; and that is the corresponding projection F A 1, B 1. Now, A 1, B 1 will not be in true length; because of course this guy is not parallel to this yeah. Now, once I have this scene which pretty much corresponds to one of the lines being in true length. And, the other one not being true length you still see the projection of that line. So, this guy is in true length, this guy may not be in true length.

Now, what I would is, I would just turn myself. And, how you look at one of these lines in point view yeah; this was what the previous scene was. Now, this would be the new scene, rather this would be the new scene; so that this line would be in point view. Now, for that you would draw hinge line which is perpendicular to what? C 1, D 1; now, C 1,

D 1 view is common. So, you are going to be measuring distances from where? From the horizontal plane take this distance; and both these distances they are going to be the same. So, take that distance and this would be the point view of line C, D; which 1 is going to be closer to you C or D?

Student: ((Refer Time: 42:43)).

Ha D would be closer to you true length this is your plane; where you would be seeing the point view yes all right; do the same exercise for A, B? Now, take distances from where? From the, which plane? Horizontal plane take that distances transfer it there, take that distance transfer it there this is you are A 2, B 2. Auxiliary plane1, and therefore the subscript 1, auxiliary plane 2; therefore, subscript 2. Now, do you figure if the lines are intersecting or not you know that they do not intersect; because the point view of C, D does not lie on the corresponding projection of A, B.

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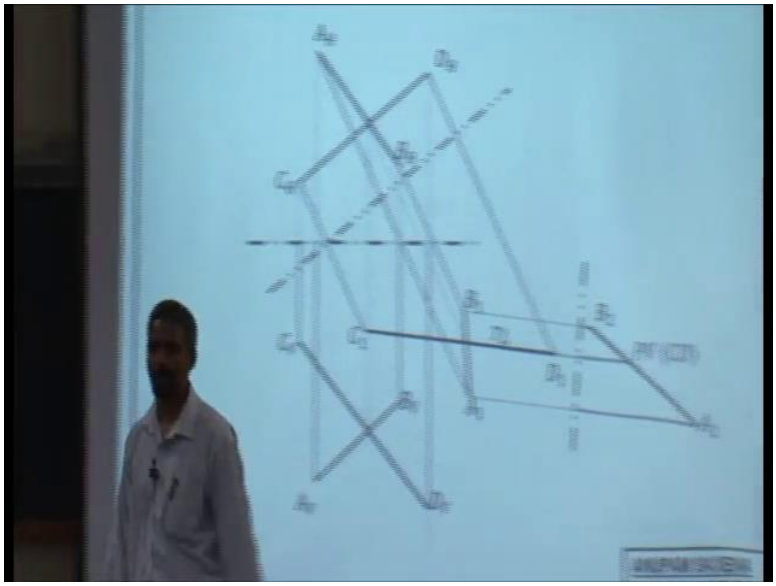

Another thing slightly modified example the same exercise hinge line. And, this I am going to be a little faster hinge line; a hinge line which is parallel to C H, D H; projectors measure distances from?

Student: ((Refer Time: 44:20)).

Yeah, transfer there this distance transfer it there, this C 1, D 1 in true length do the same thinking for A, B. Take the projectors perpendicular to this hinge line measure distances

from here transfer it there, measure this distance transfer it there; you get the corresponding projection of A, B say A 1, B 1. Now, C 1, D 1 is in true length. So, if you look at a view perpendicular to it you will get point view of C 1, D 1. Hinge line perpendicular to that measure this distance transfers it there; you get the point view of C, D. Do the same things for A 1, B ;1 measure this distance take that distance transfer it over there you get A 2, B 2. Now, the point of view of C, D lies on A 2, B 2; that means that these 2 lines in space they intersect ok, yeah. Hold on, clearly this is point of intersection; if you project it back this is where your intersection is happening. If you project that back on to the top view this is where the intersection is happening. And, if you project that down this where the intersection is happening ok.

So, just by looking at this view and this view and realizing that the point of intersection over here and over here; if they lie on the projector or projection which is perpendicular to this hinge line only then the 2 lines will intersect otherwise they would not. So, in the first example that was not the case, in the second example these 2 corresponding intersections they lay on the same vertical projection yeah; a little test yes; you are question done ok.