Indian Institute of Technology Kanpur
National Programme on Technology Enhanced Learning (NPTEL)
Course Title
Engineering Graphics

Lecture – 25
Normal/Auxiliary View

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So last class I have discussed four step procedure for normal view of an oblique line.

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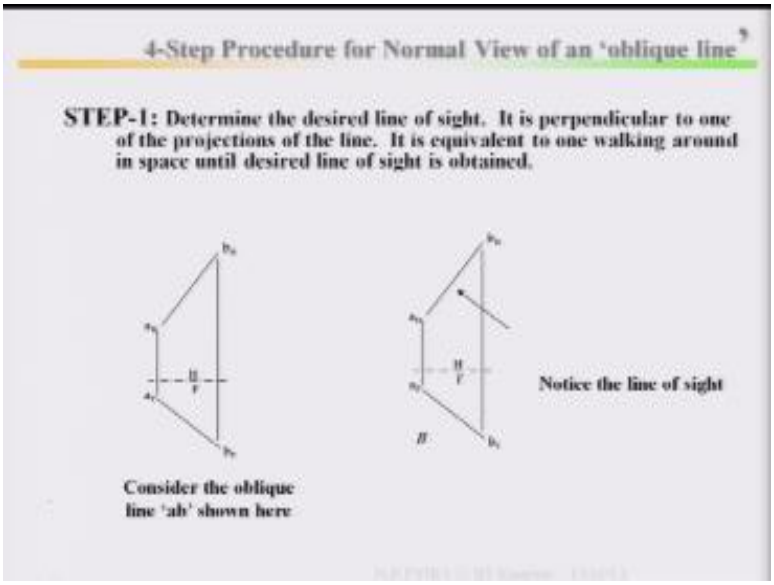

So first you determine your desired line of sight and it is perpendicular to one of your projection lines means desired line of sight whether which line you are going to do it then find it out desired line of sight. Then it is equivalent to one walking around this space until desired line of sight is obtained.

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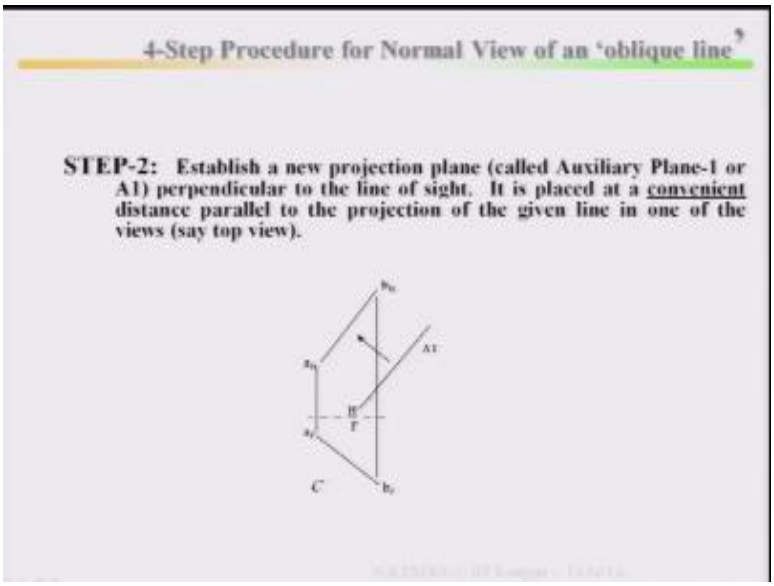

Then second step is your – establish a new projection plane that is called auxiliary plane 1 or auxiliary plane perpendicular to a line of sight. So in this case this is your line of sight that means new auxiliary plane will be perpendicular to your line of sight. Then once you make it your line of sight then perpendicular to a new projection plane of your line of sight that is called your auxiliary plane.

Go to your – now here if you look at here this is your line of sight and this is your perpendicular new projection line which is perpendicular to line of sight called auxiliary plane 1.

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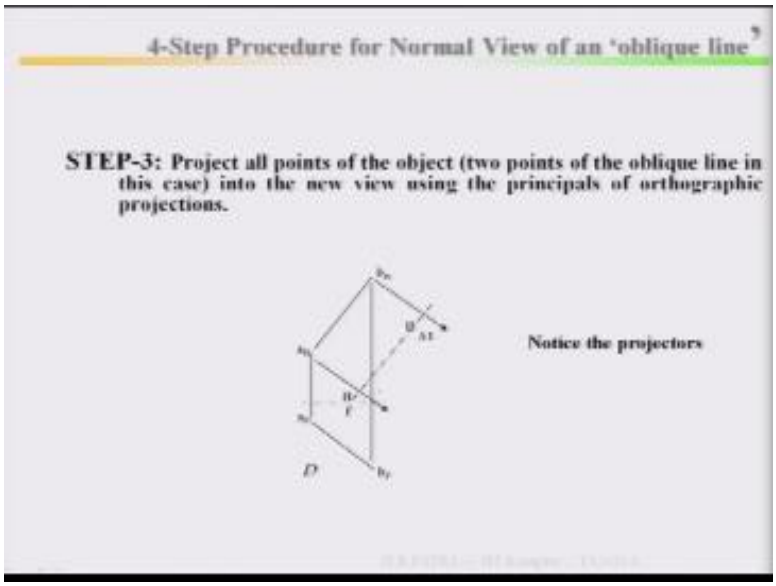

Then come to your step 3, in step 3 project all points of the object that means in this case of line if H and BH particularly in your top view is for your horizontal plane. So in horizontal plane that means in your top view there are two points A and B, project all points of the object into new viewing using principles of orthographic projections.

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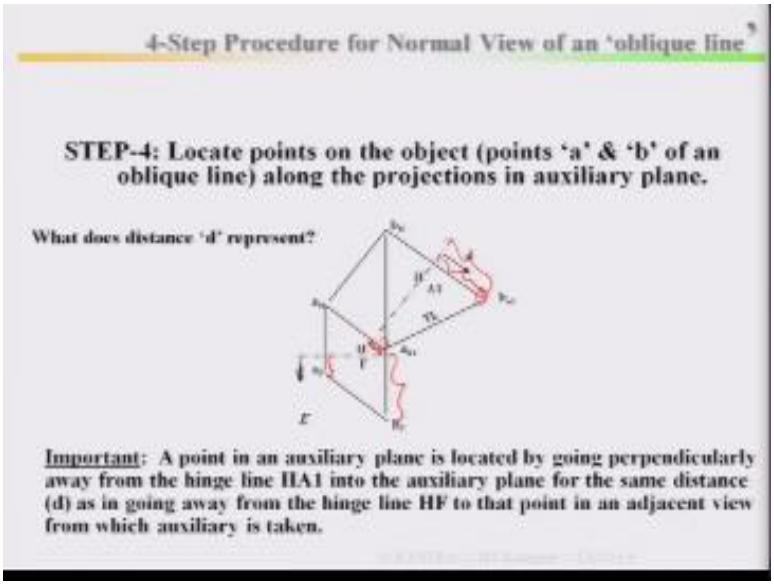

Now step 4, locate this, locate points on the object along the projection in auxiliary plane. So particularly if this is your auxiliary plane, then this distance as I said earlier this distance and this distance will be distance of the opposite view, that means this is your front view from your hinge line, that means this distance equal to your this distance and this distance equal to your this distance.

Then after getting this projections points respective points join this two points and this will give your true length of the line in the top view. Similar procedure has to be followed for your front view. This is what we have covered up to last class.

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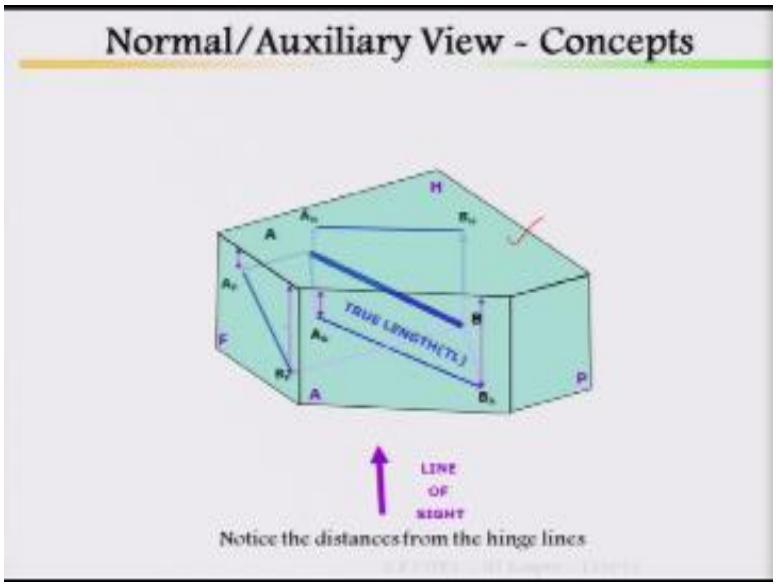

Now if you look at your three dimensional view, concept of your auxiliary. Now this is a Q in this Q this is a frontal plane and this is your auxiliary plane, and this part is your horizontal plane, and there is your oblique line AB. Then from this oblique line draw this, this is your frontal plane, in this frontal plane this view will come as a front view. Then this has been termed as AF and BF, from AB to your horizontal plane draw the line then name it as AH and BH.

Then from this AB draw the lines, that is your AA and BA with respect to your auxiliary plane. Then this is your true length if you take it, look at the distance, if I take from this hinge line to this distance suppose to be same as from this hinge line to this distance, because I am taking auxiliary view of the top view line, that means opposite view is your front view that means from the hinge line this distance and this distance suppose to be same.

Similar case from this hinge line to this point, the distance will be from this hinge line to front view, this distance will be your same. So this is all about the three dimensional how your distance comes into picture.

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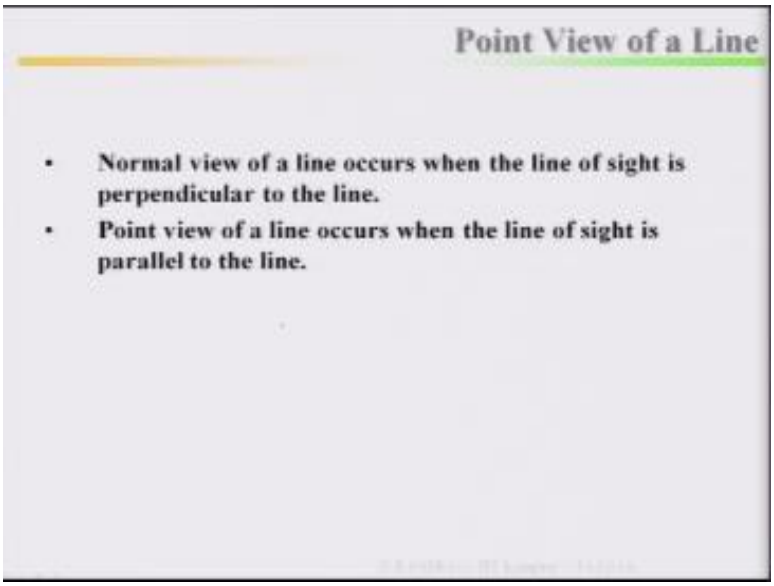

Now come to this points normal view of a line occurs when the line of sight is perpendicular to the line. Normal view of a line occurs when the line of sight is perpendicular to the line, line of sight is perpendicular to the line. Point view of a line occurs when the line of sight is parallel to the line, normal view that means if this is your line, then that means line of sight, line of sight is perpendicular to the line. And in this case a point view line of sight is parallel to your line.

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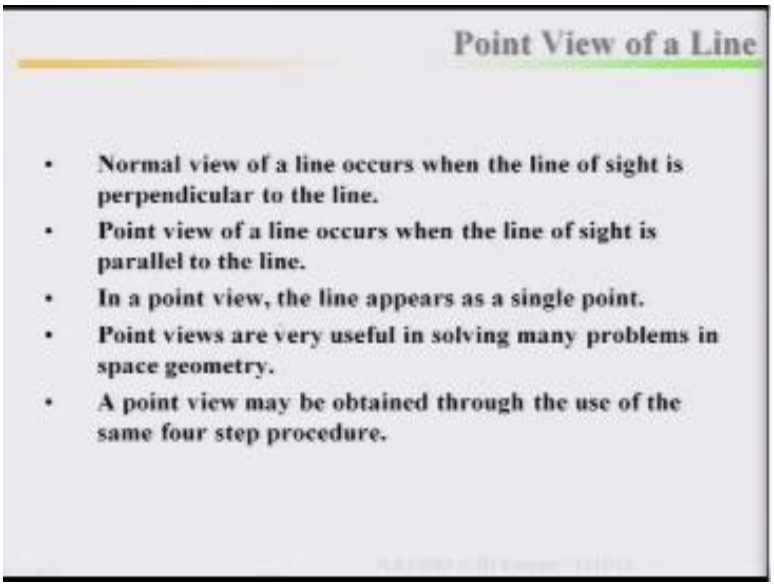

In the point view the line appears as a point. Point views are very useful in solving many problems in space geometry. A point view maybe of 10 through the use of same four step procedures. As you have done it same four step procedures can be used to find it out the point view.

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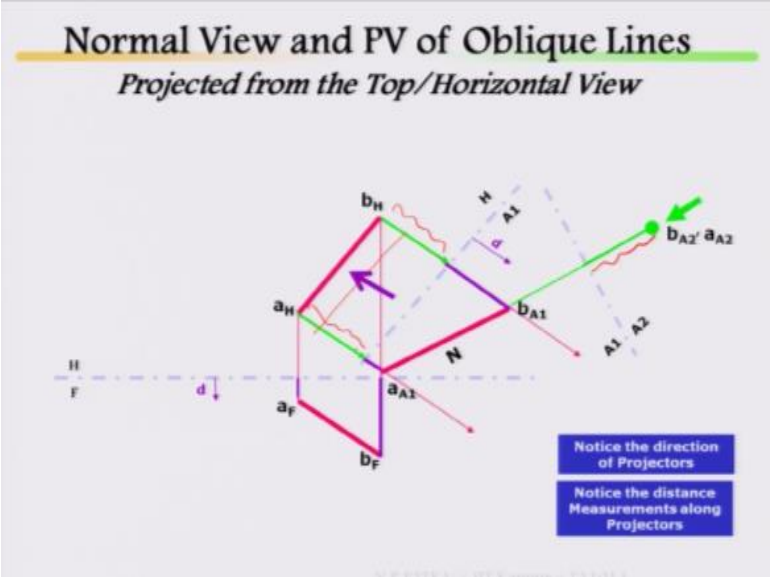

Now normal view and point view of oblique lines, let us look at one example. Horizontal plane, frontal plane, this is your front view, this is your top view AF, BF, AH and BH. Then this is your line of sight as I said, then with respect to your line of sight auxiliary plane, auxiliary plane you can draw at any distance, at any distance. It can be drawn here, it can be drawn here. Then this is your horizontal plane, with respect to horizontal plane this is your auxiliary plane.

Then draw the lines perpendicular to your auxiliary planes, then notice this direction of the projections. Then measure the distance in the opposite view front view, the distance has been measured. Then reproduce this same distance here, this is the distance D, this is the distance D, notice the distance measurement along the projectors. Then similarly B point distance has been taken from here to here, here to here you make it. Then draw the line AA1 and BA1 this is your normal or true length.

Then this is your true length with respect to your line in top view. Then take this with respect to this take your normal view where it is parallel to your line. Then draw another projections or another line that it pass to one was your A1 auxiliary plane 1, A2 auxiliary plane A2. Then take this distance from here to here, here to to here because this is the opposite view, with this

opposite view this is, then with respect to normal plane this distance has been drawn, this distance will be this distance and this distance, then mark this point this will be your point view, this is will be your point view where bA2 and aA2 will merge, this is your point view.

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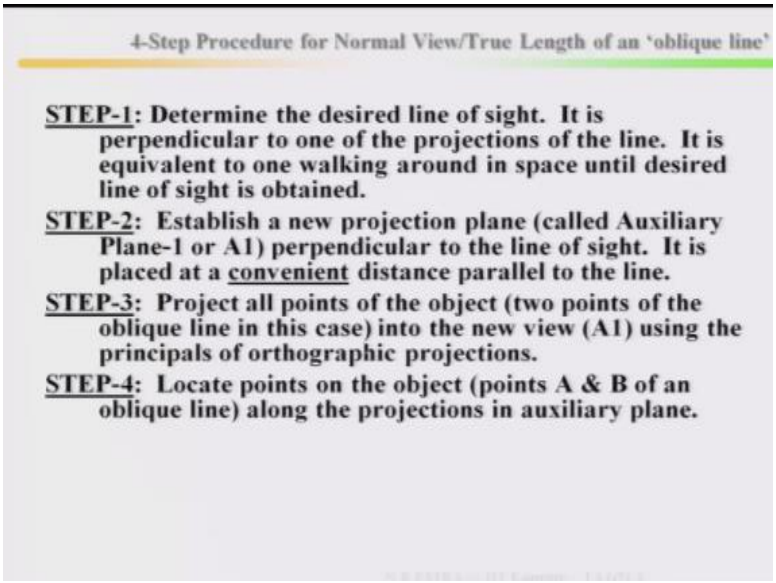

So 4 step procedure for normal view true length of an oblique line we have said, determine the desired line of sight it is perpendicular to one projection of the line and it is equivalent to one walking around in space until desired line of sight is obtained. Step 2, establish a new projection plane, this is as a summary called auxiliary plane, either you can name it as A1, A2 and A3 perpendicular to the line of sight it is placed at a convenient distance parallel to the line, it is placed at a convenient distance parallel to the line, project all points of the object, two points of the oblique line in this case into the new view that is your A1 using principles, principals of orthographic projections.

Then locate points on the object, point A and B of an oblique line along the projection in auxiliary plane, this is what your step 4 step has been used.

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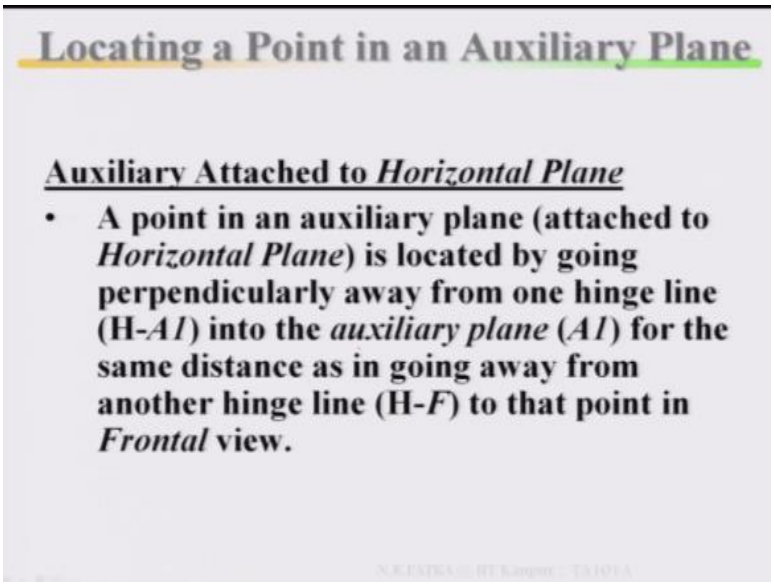

Auxiliary attached to horizontal plane, a point in an auxiliary plane attached to horizontal plane is located by going perpendicularly away from one hinge line that is H-A1 into the auxiliary plane A1 for the same distance as in going away from another hinge line H-F to that point in frontal view.

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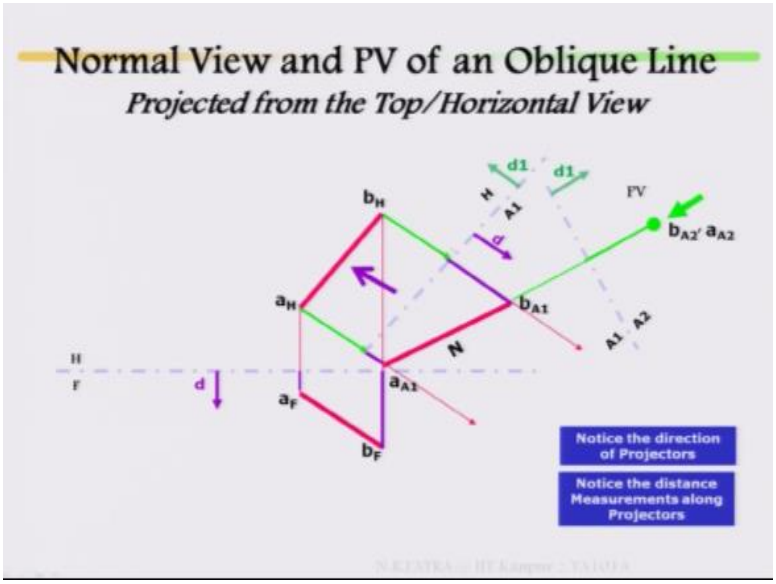

Look at here this is your front view, in horizontal plane a_H and b_H top view, then line of sight step 1, then draw your auxiliary plane step 2 at any distance, then draw the line of the projections, then measure the distance in your opposite view in your front from your hinge line, then relocate same distance in your auxiliary plane, then b_F point has to be measured from your front view distance from your hinge line, then relocate it this is your b_F point and this is your aA1 and bA1 auxiliary plane, this is your true length in auxiliary plane A1, then go to your line of sight with this directions it is your parallel line of sight.

It is not perpendicular the way it is looking at your line of sight is perpendicular, here line sight is parallel to your true length, then draw auxiliary plane A2, this is your A2, then measure the distance of your opposite top view so this is your top view, this distance is your same distance from here auxiliary plane A2 plot it, then draw your point view. So this distance d1 is supposed to be same as this distance d1, distance from here to here d1, distance from here to here d1 supposed to be same.

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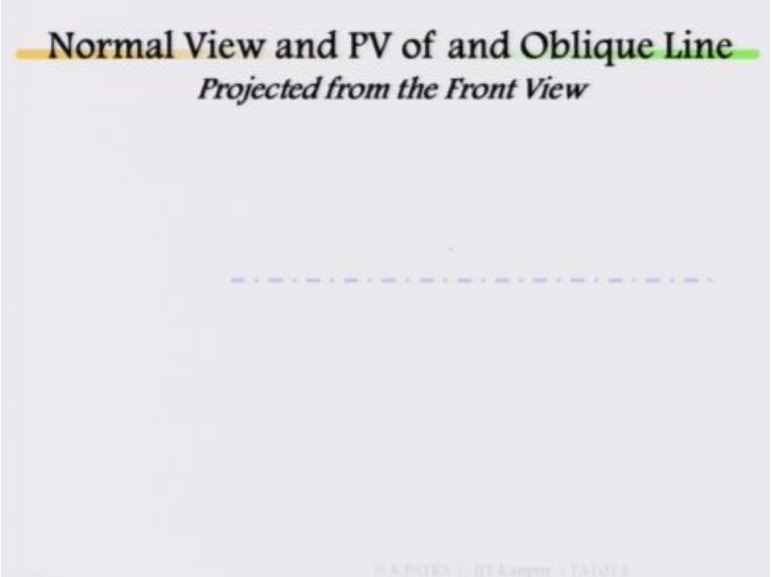

Now normal view and point view of an oblique line projected from the front view. Now you have seen projected from the top view, same procedure has to be continued in this case the distance will be measured for getting your true length from the top view because that is your opposite view of your front view, now come to this.

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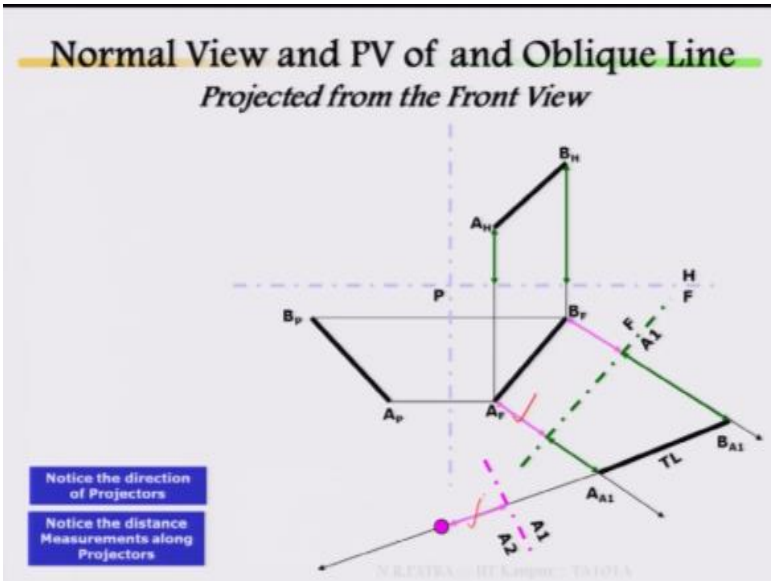

Horizontal plane, frontal plane, and profile plane has been drawn, this is your top view A_H and $B_{H,}$ this is your front view A_F and $B_{F,}$ earlier whatever we have drawn that was with respect to your top view now we are going to draw, that means your true length of a line as well as point view with respect to front view, that means with respect to front view, then this is your side view A_p and $B_{p.}$

That means profile plane, then draw first auxiliary plane A1 with respect to your front view. Notice the direction of projections projector then from there draw the projector, then measure the distance, measure the distance opposite view in the top view this is your distance. To locate your point A and B this point has been located A and B and this is your true length, then from this true length draw a line which is parallel joining this line, then draw another projection another auxiliary plane that is your A2 and from this A2.

And measure the distance from A1 how from where your projected it back with respect to A1 it has been projected back, from A1 how far is your front view, then this distance, this distance, and this distance are same, then locate your point view. This is the same procedure 4 steps which has been used to find it out your true length and point view with respect to top view, same

procedure has been used to find it out your true length of a line and point view of a line with respect to your front view.

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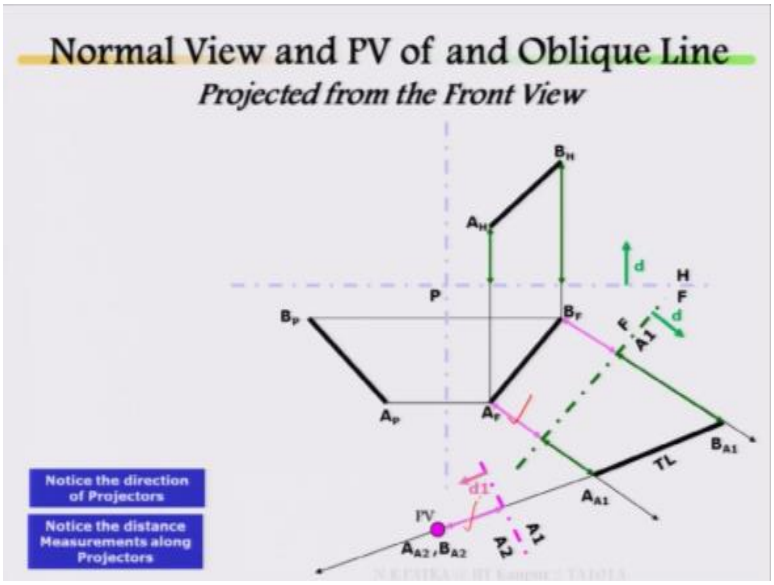

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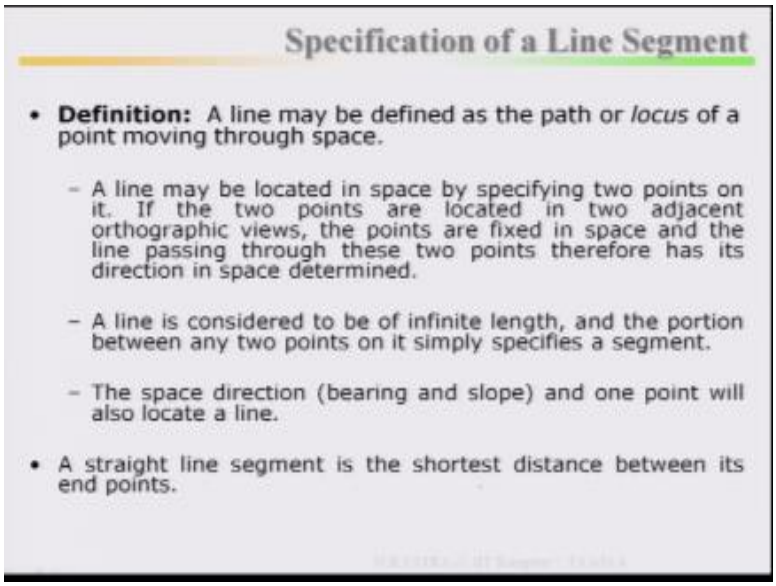

Now specification of a line segment definitions. A line may be defined as the path or locus of a point moving through the space, a line look at carefully, a line may be defined as the path or locus of a point moving around the space. A line may be located in space by specifying two points on it, a line may be located in space by specifying two points on it, if the two points are located into adjacent orthographic views the points are fixed in the space and line passing through these two points therefore has its direction in the space determined.

These are the definitions, a line is considered to be infinite length, a line is considered to be of infinite length and the portion between any two points on it simply specifies a segment, the portion between any two points on it simply specifies a segment. Then the space directions, bearing and slope and one point will also locate a line, the space directions and one point will also locate a line. A straight line segment is the shortest distance between its end points, a straight line segment is the shortest distance between its end points, between its end points.

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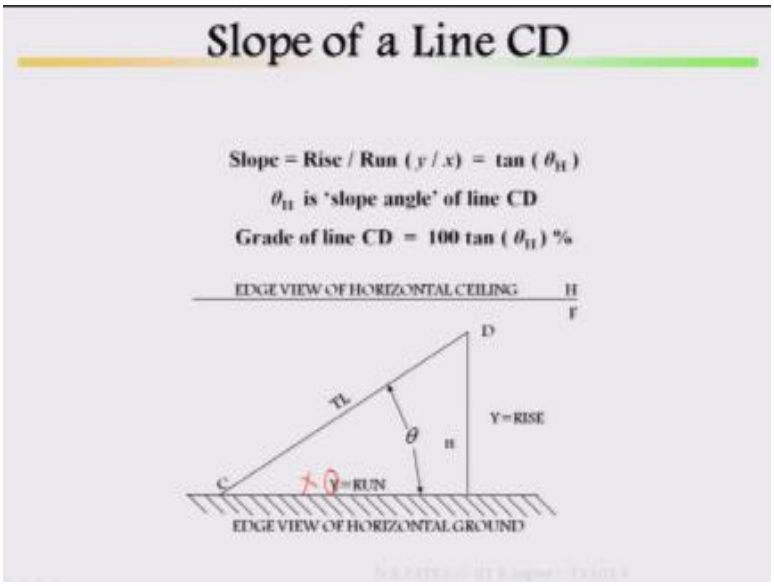

Now try to understand, slope of a line CD, line CD is there this is a in true length, slope of a line CD, if I define its slope, slope is rise/run, rise/run. If I take it rise is Y run is your X, sorry this is wrong, this has to be X, rise is Y run is X. So slope will be rise/ run that will be Y/X. So that term large tan θ, θ_H is slope angle of a line CD. Now grade of a line this is your slope, second part is your grade of line CD, what is the grade of line CD? Grade of line CD is equal to 100 x tan θ_H in terms of percentage.

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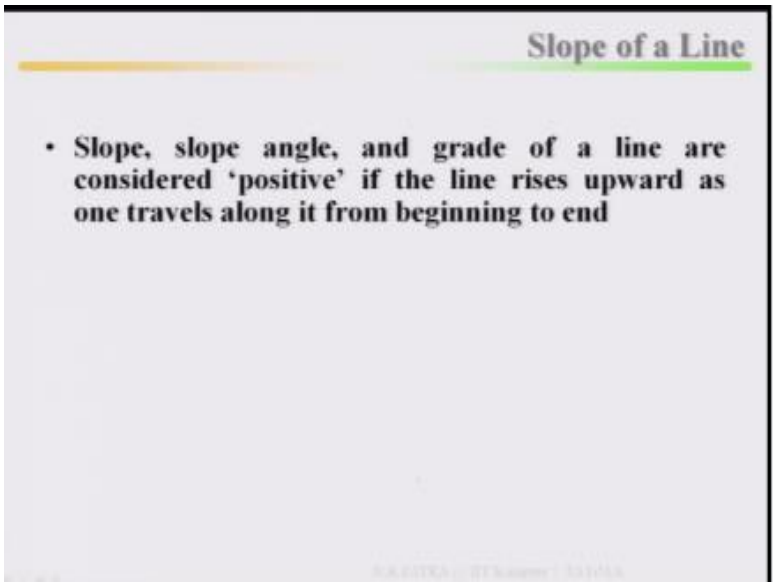

Slope, slope angle, and grade of a line are considered positive if line rises upward as one travel along it from beginning to end.

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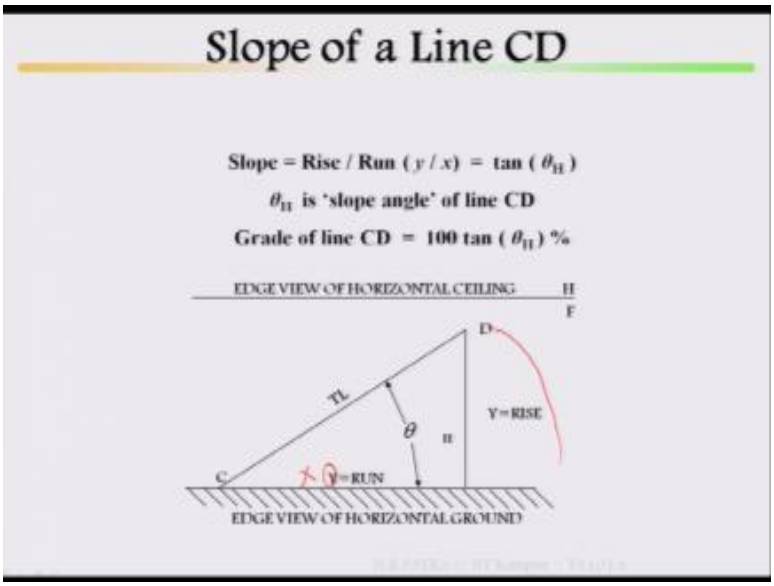

Here line travels upward, line travels upward.

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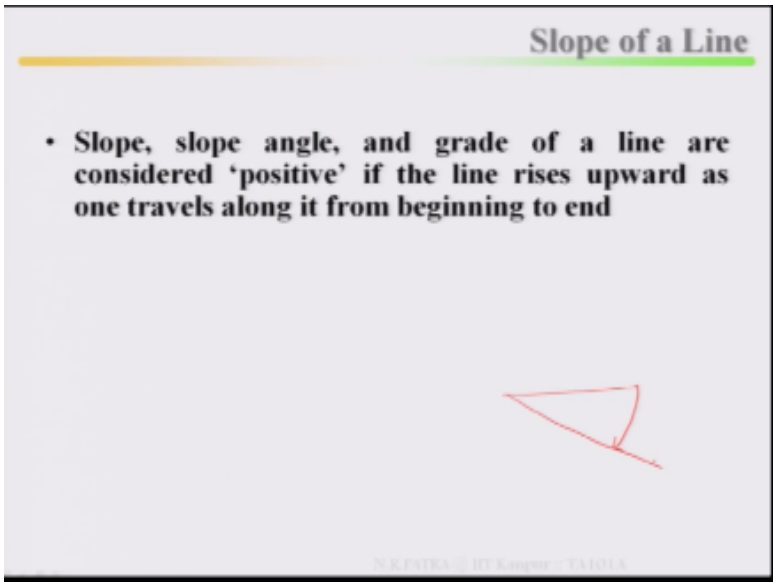

So in this case slope, slope angle, and grade termed as positive, if lines, line travel downward, downward then it will be termed as negative.

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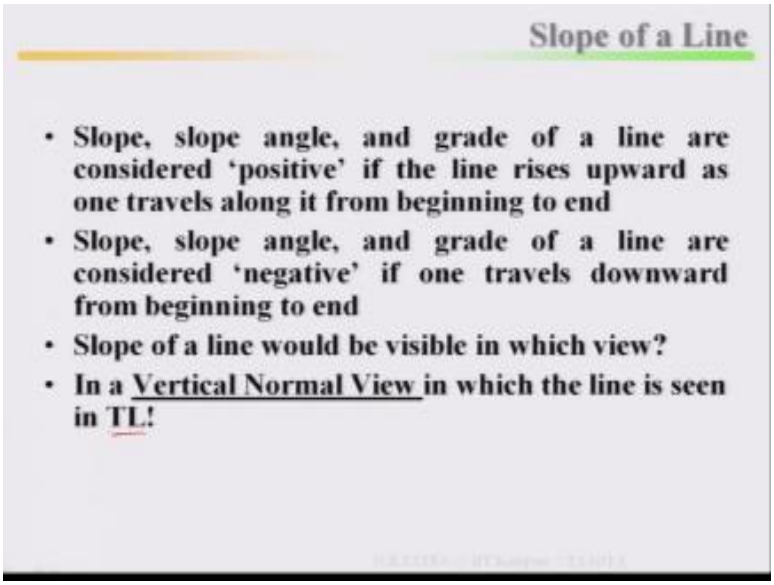

So slope, slope angles, and grade of a line are considered negative if one travels downward from beginning to end. Slope of a line would be visible in which view? That is a question, slope of a line would be visible in which view? In a vertical normal view, in a vertical normal view in which line is seen in true length, remember in which line is seen in true length, unless you do not get line in true length this slope and slope angles cannot be visible.

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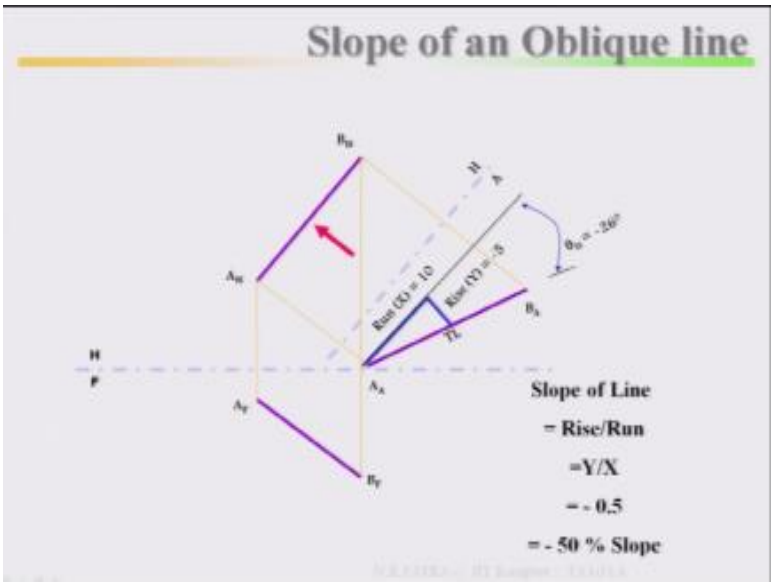

Now look at here, slope of an oblique line, horizontal plane, frontal plane, line drawn in frontal plane, line drawn in horizontal plane AF, BF, AH, BH, then this is your line of sight and this is your auxiliary plane A1 and this is what happening? This is your true length, this is your true length of your line, with respect to this true length with respect to what? With respect to your top view you can get true length of this line with respect to your front view you can get it here, this is your true length. Now it is AA and BA.

Then find it out what is your Run, run is your X that means from here to here what is your run? X=10 then what is your y? y is rise, rise = -5, why it is -5? It is from here we go downward that is why it is -5, now slope of a rise line, rise/run, y/x. So it is supposed to be -5/10 which is equal to -0.5. So -50% slope that means it is downward. So θ_H it is downward, it will be tan θ_H. So tan θ_H I say earlier, what is your θ_H ?

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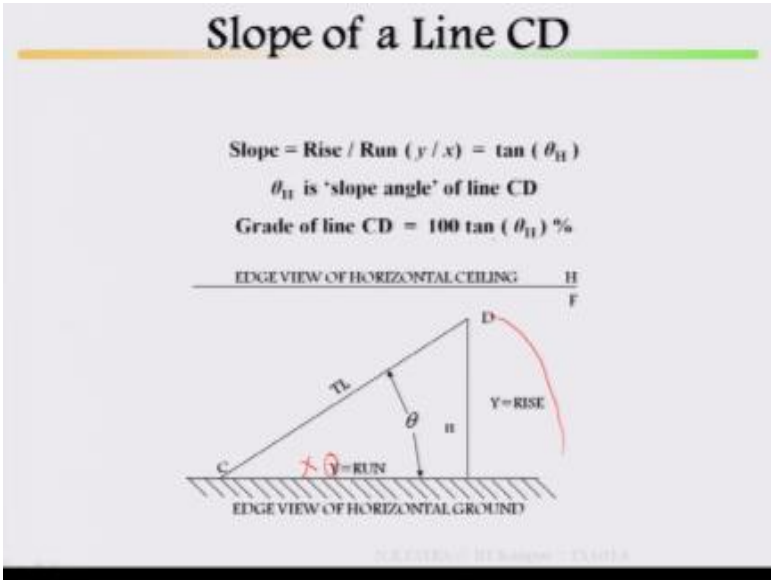

θ_H tan θ_H rise/run.

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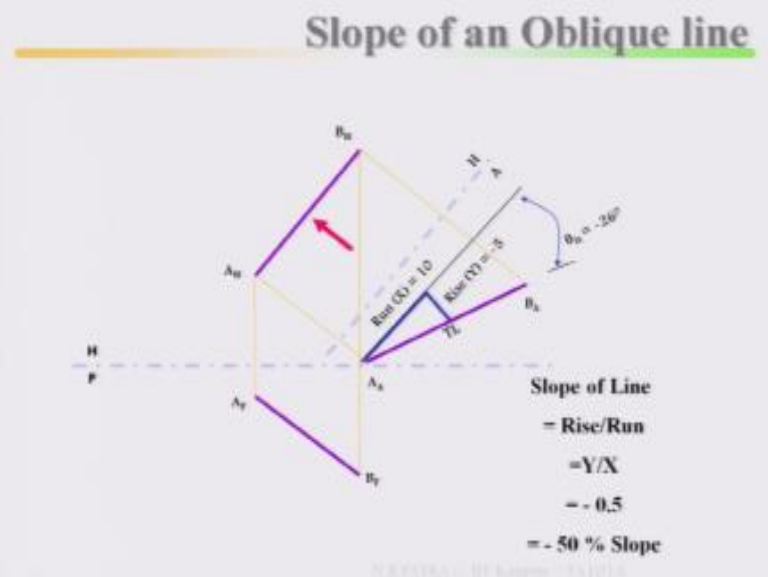

So in this case it is coming about to θ is supposed to be -26 degree, this is all about basic oblique lines and true length, point view, as well as slope, as well as your grade of a line we discussed. Now some more animation I want to show you, principle orthographic views look at here.

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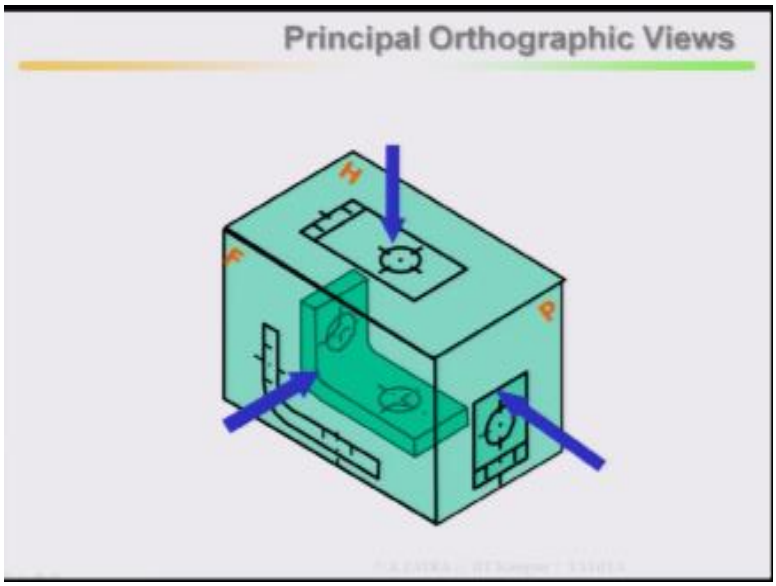

You can more understand this space geometry, frontal plane as I said earlier object it behind. So you are looking from the front your object in your frontal plane is there, then horizontal plane. So object you are looking from the top this is your top view, then profile plane this is your side view.

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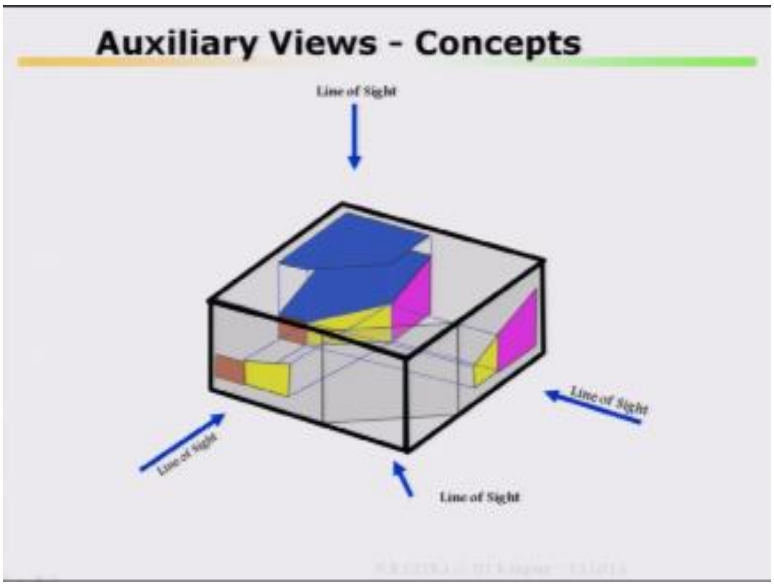

Then you rotate it, now look at here, auxiliary view concepts, earlier I have shown that orthographic view concept, now it is a auxiliary view concept. Now look at here, I put it in cube, now this is your line of sight. So this is what project it back, line of sight project it back, look at here in a cube this is your line of sight, this is your line of sight, I colored it. In this line of sight you can see this color, in this line of sight you can see the colors. Then look at the top line of sight what you are supposed to see it, look at the colors. Now line of sight somewhere else here, if this is front, this is your top, and this is your sight, I am putting somewhere else your line of sight that is your auxiliary.

Then how your line of sight looks like if you look at here this is your front, this is your profile, and this is your top. Now how is your line of sight looks like?

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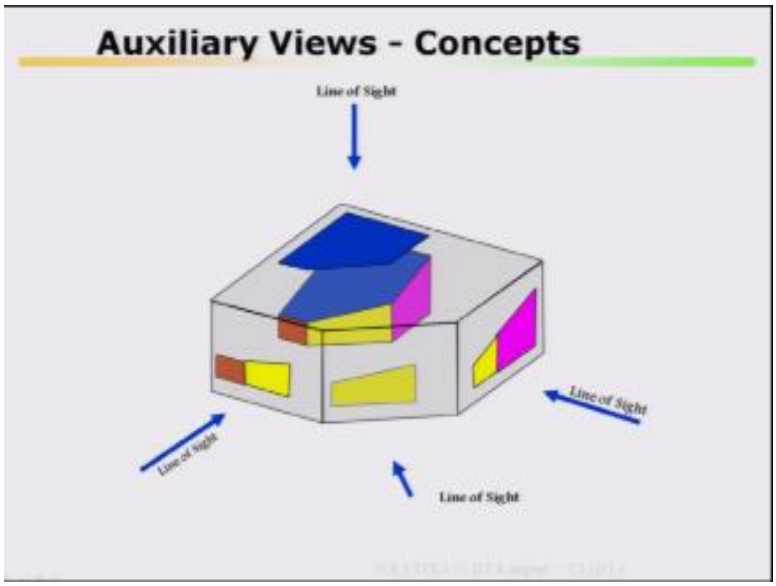

See take it out, this is your auxiliary, so in three dimensional concept if you look at here front, profile, as well as top, and auxiliary.

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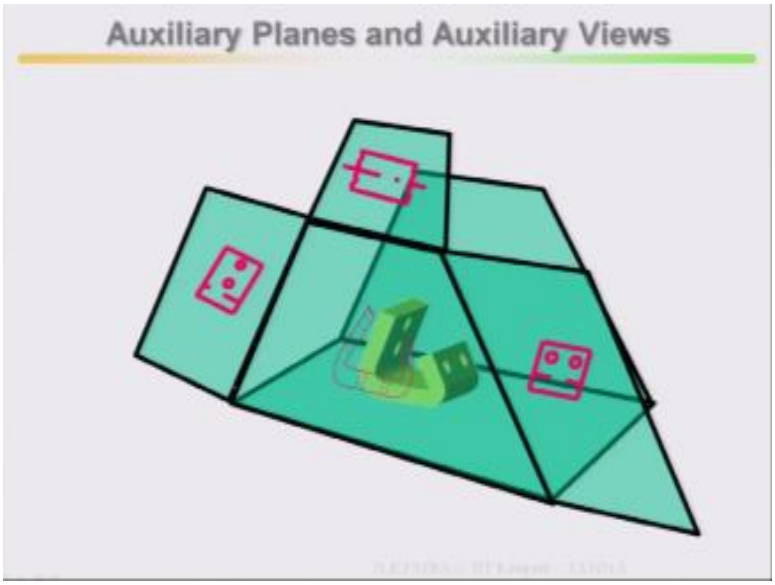

Now come to this, auxiliary plane and auxiliary views, put this object inside a cube put this object inside this box. Then project it back, this is your front, project it back, this is your profile or side view, then project it back, this is your profile and side view, this is your right hand side view, this is your left hand side view project it top, this is your top view, then rotate it I rotate it, right hand side view, left hand side view, front view and top view all rotation has been made with respect to front view, front view is your stationary. As I said earlier, front view is your stationary.

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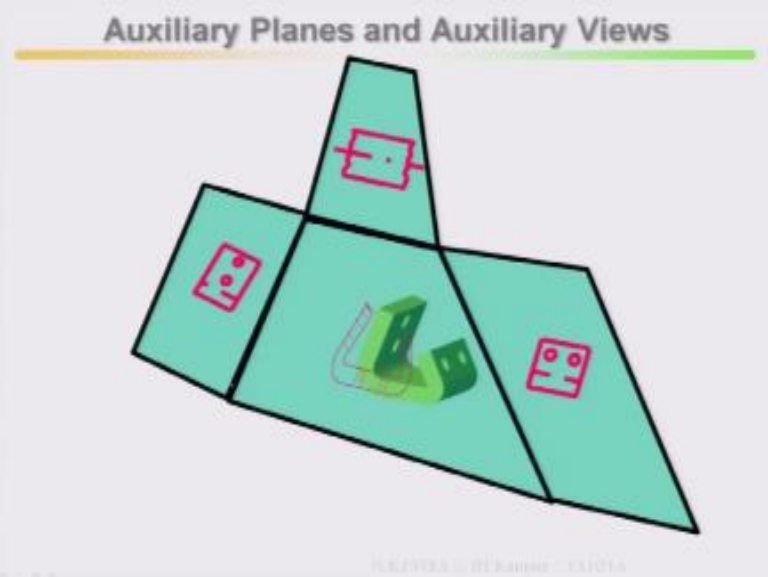

Now you are getting all the views, front view, top view, right hand side view and left hand side view, now look at here.

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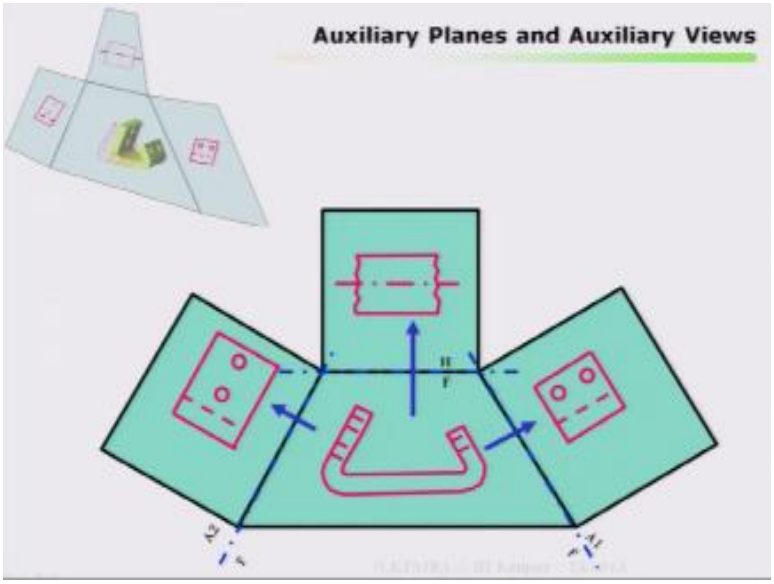

In this case, front, top, right hand side view, left hand side view. Now draw the hinge line, horizontal plane, horizontal plane top view will be there, frontal plane front view will be there, now look at here.

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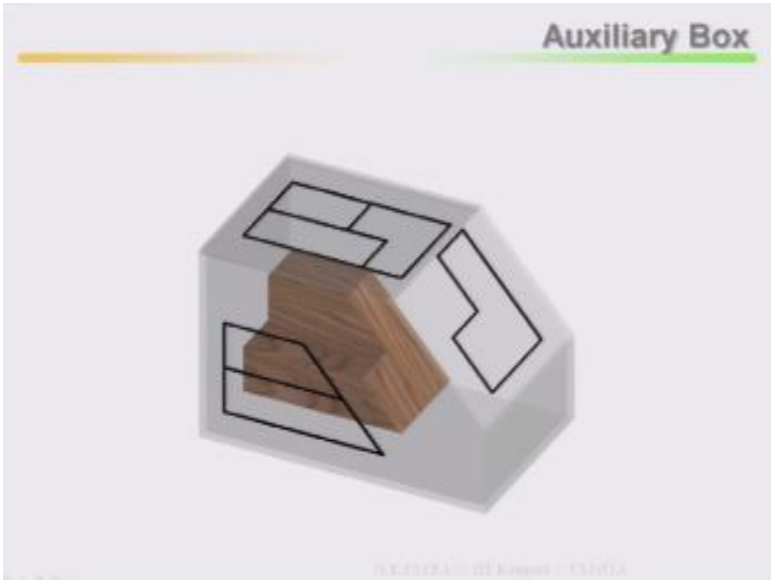

Auxiliary box, look at here auxiliary box, how the auxiliary box has been put it, this is your auxiliary box.

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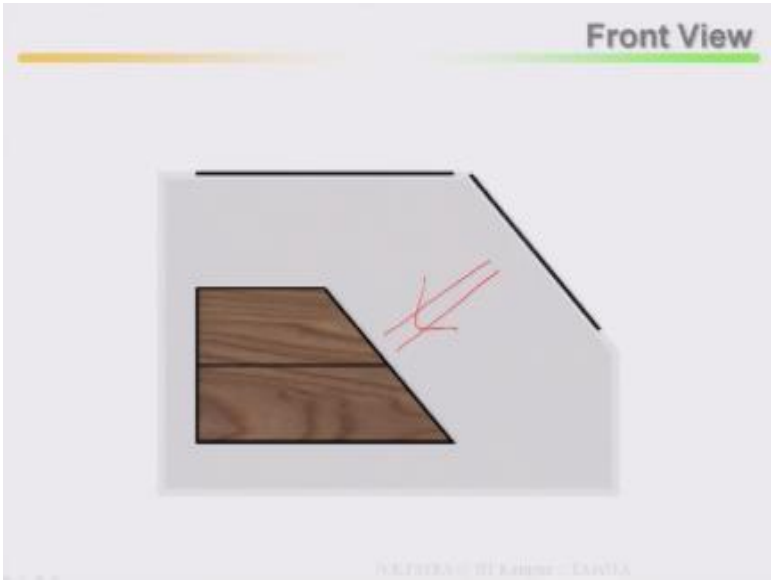

Now look at here, front view with respect to front view where is your auxiliary box? This is your front view and with this, this is your line of sight, this is perpendicular, this is your auxiliary line or auxiliary plane.

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Then with respect to unfolding this box, how is your auxiliary plane looks like if you unfold it front view, top view and cut it, so this is your line of sight where it is perpendicular, so this will be coming to your auxiliary plane or auxiliary view.

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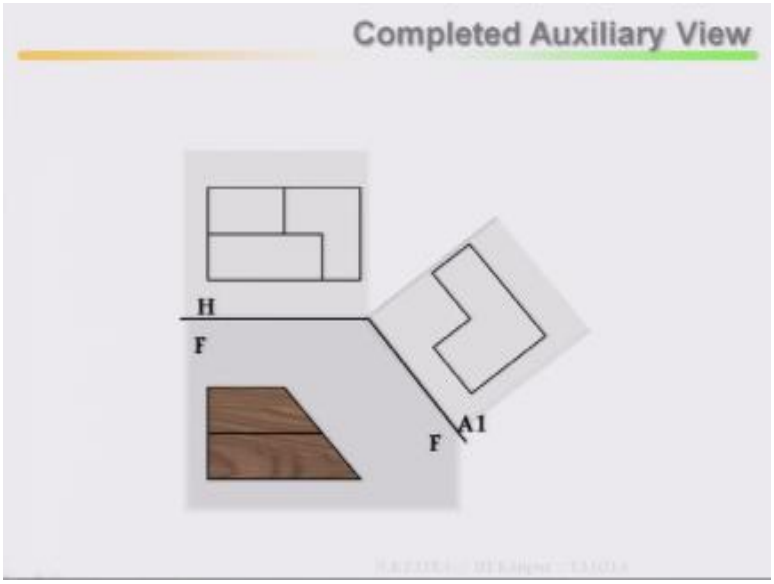

Look at here, front view, top view, cut it and this is your auxiliary plane or auxiliary view.

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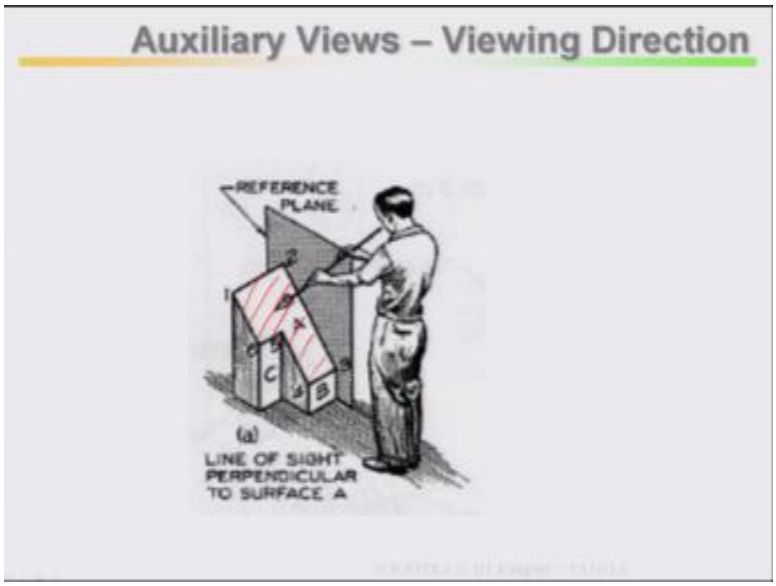

Then auxiliary views viewing directions, which direction you are supposed to see, look at here 3D picture, line of sight perpendicular to surface (a), if I am looking line of sight perpendicular to the surface (a) this can be said as auxiliary. So reference plane so this is your auxiliary plane. Line of sight perpendicular to surface (a), here line of sight it is perpendicular to surface (a), this is the surface it is perpendicular to this. So this plane will be your auxiliary plane, and the view you are getting that is your auxiliary view.

Once you get the auxiliary view because it perpendicular to this whatever you are getting that will be your true length or true shape. So unless if you are not getting true length and true shape particularly in drawings where assembly or may be the object then you cannot define, what is its size, so then there is your auxiliary view or auxiliary plane comes into picture.

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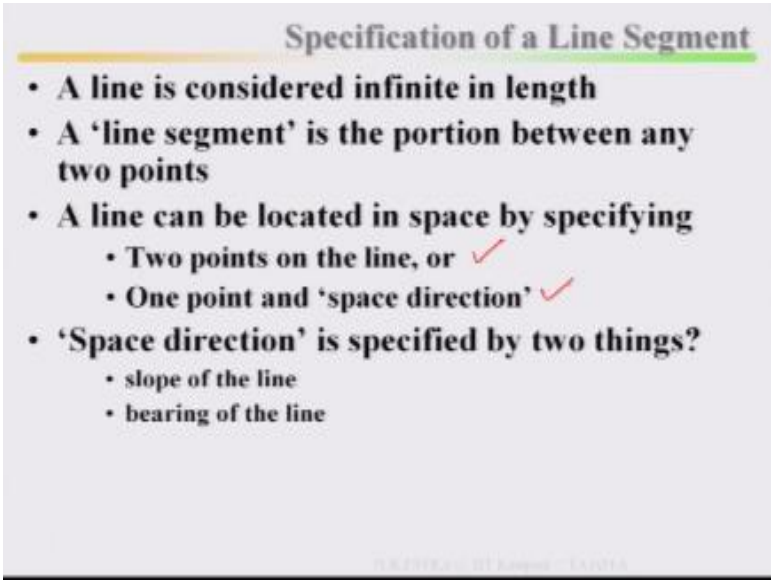

Specification of a line segment, a line is considered infinite in length. A line segment is portion between any two points. A line can be located in space by specifying two points on the line or one point and a space directions, remember these. A line can be located in space by specifying two points on the line or one point and space directions, or one point and space direction. Space direction is specified by two things, which I have discussed slope of the line, bearing of the line. Slope as well as bearing of the line, so this is all about part of your space geometry basic introductions.

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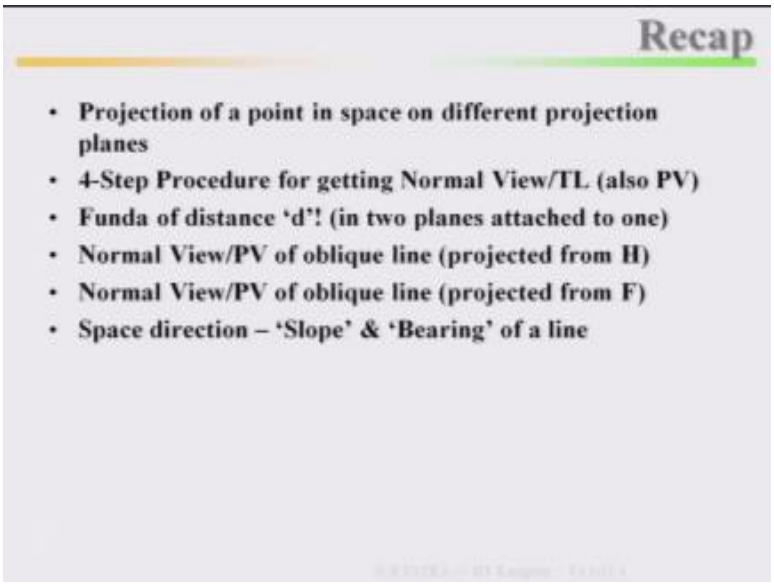

So what we have done up to now, projection of a point in space on different projection planes, on different projection planes and we learn four step procedure for getting normal view true length as well as point view of a line. Four step procedure for getting normal view or true length, also point view. Funda of distance d that means in two plane attached to one has been cleared then normal view, point view of your oblique line projected from H or horizontal plane.

Normal view and point view of your oblique line projected from front view, projected from top view, projected from front view. Then space directions, slope and bearing of a line up to this, this has been covered and we have learn. Next class I will go further to find it out angle between the lines and line to line intersection points we will discuss. Before you go to plane or intersection between lines and planes, intersection between planes and planes, angle between planes in the space. Thank you.

Acknowledgement
Ministry of Human Resource & Development

Prof. Satyaki Roy
Co-ordinator, NPTEL IIT Kanpur

NPTEL Team
Sanjay Pal
Ashish Singh
Badal Pradhan
Tapobrata Das
Ram Chandra
Dilip Tripathi
Manoj Shrivastava
Padam Shukla
Sanjay Mishra
Shubham Rawat
Shikha Gupta
K. K. Mishra
Aradhana Singh
Sweta
Ashutosh Gairola
Dilip Katiyar
Sharwan
Hari Ram
Bhadra Rao
Puneet Kumar Bajpai
Lalty Dutta
Ajay Kanaujia
Shivendra Kumar Tiwari

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