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

Lecture – 10
Isometric Projections-Part-II

by
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Last class we have covered isometric projections.

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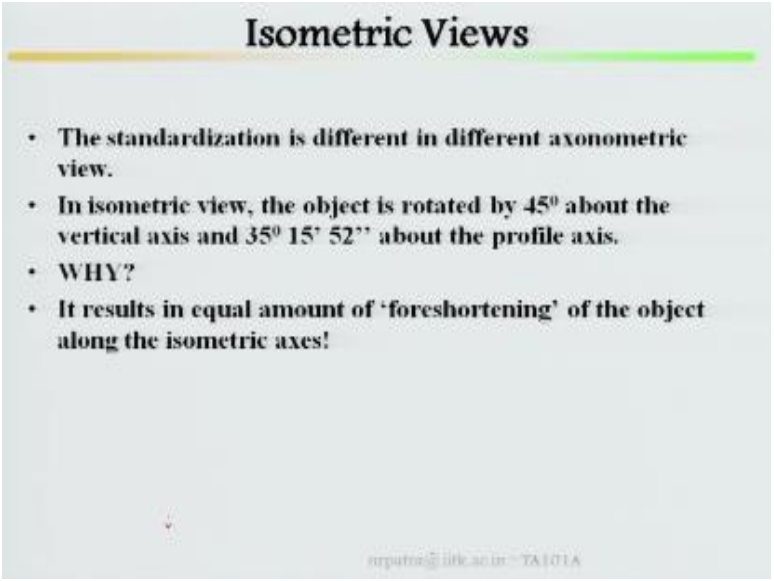

Isometric views, so in isometric view the object is rotated by 45° about the vertical axis and 35°, 15 minute, and 52 second about the profile axis. It results in why, why it has been rotated 45° about the vertical axis, then 35° approximately about the profile axis because it results in equal amount of foreshortening of the object along the isometric axes.

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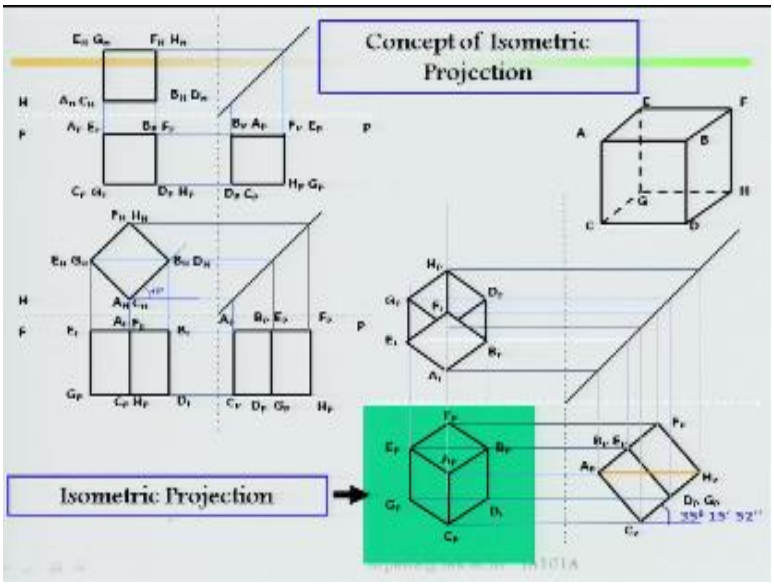

Upto this, I have finished upto the last class.

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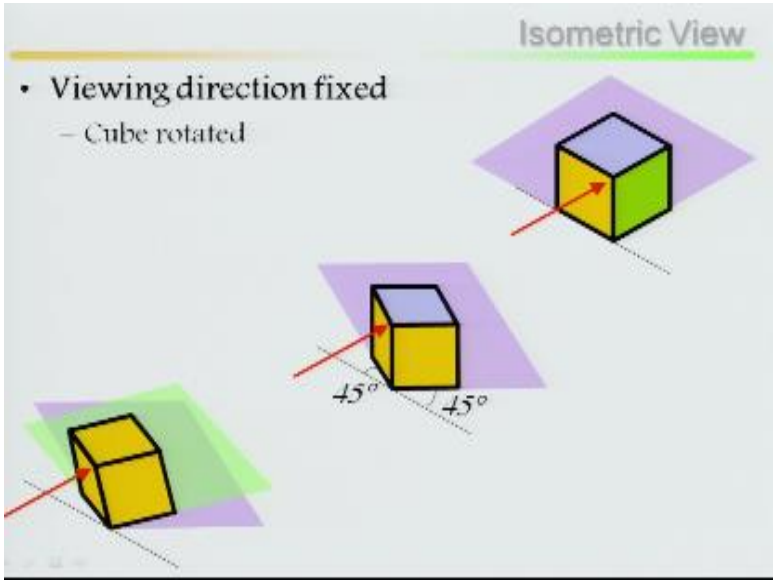

Go to this viewing direction is fixed just in terms of this is a cube and this direction is fixed and it has been rotated with your vertical axis by means of 45°, it has been rotated 45°, cube is rotated.

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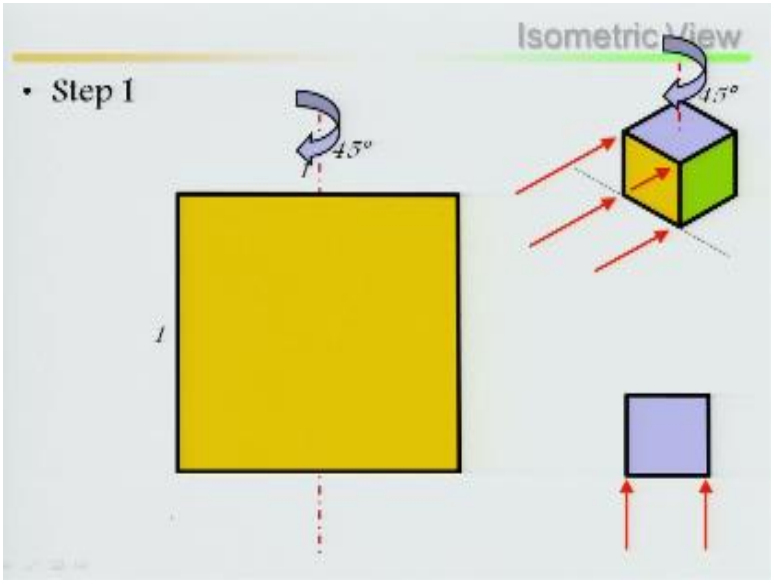

Step 1, so step 1 all length will be let us say length, width and height will be one in 11 unit dimensions, then it has been rotated about the vertical axis by 45°.

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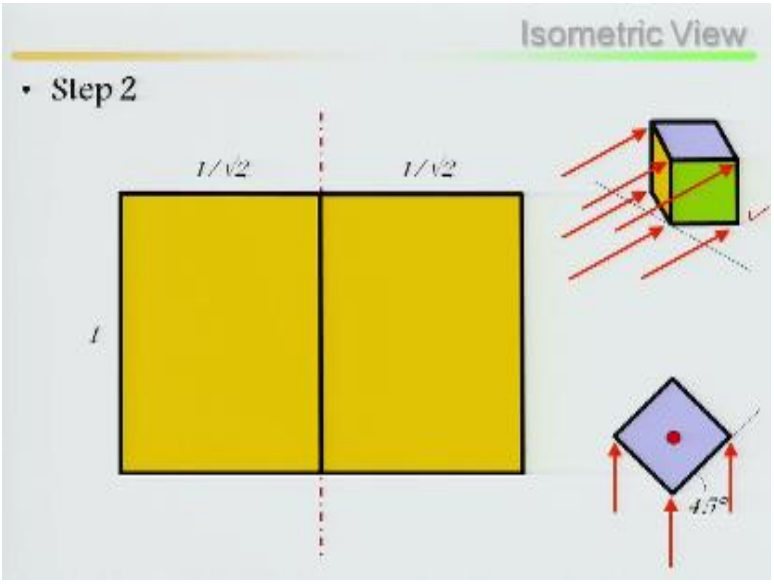

Once it has been rotated by 45°, this is the cube how it looks then you can see both the faces so it will be 1/√2 and 1/√2 at one side and other side will be 1, then further.

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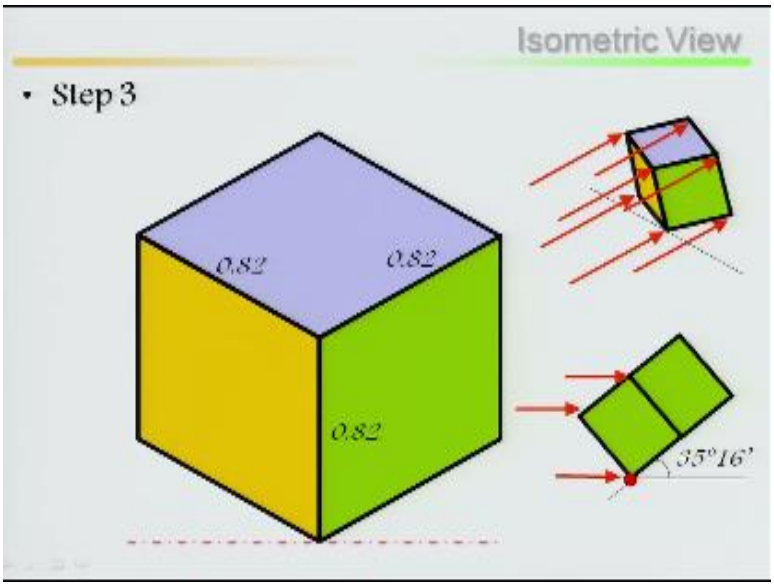

It has been rotated at an angle of 35° 16 minute about the profile axis, about the profile axis. Now in step 3 the view comes out to be all around length, height, and depth, all will be foreshortened by means of 0.82 times, it will be shorten by means of 0.82 times that means equal shortened.

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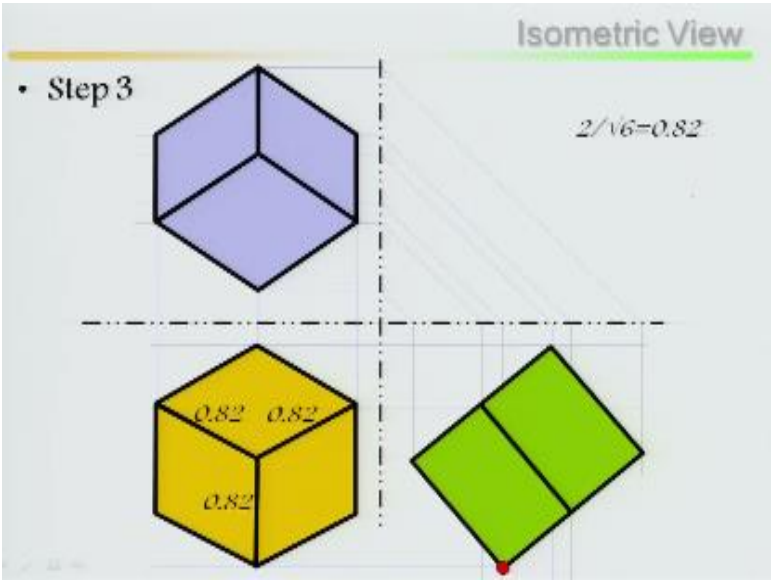

So this is step 1, all the sides having unit dimension 111, then it has been rotated by 45° then it become 1 and here 1/√2+1/√2, then it has been rotated my in step 3 about the profile axis it has been rotated, so it will be 2/√6 so all the sides now seems to be, all the sides has been reduced to 0.82 times.

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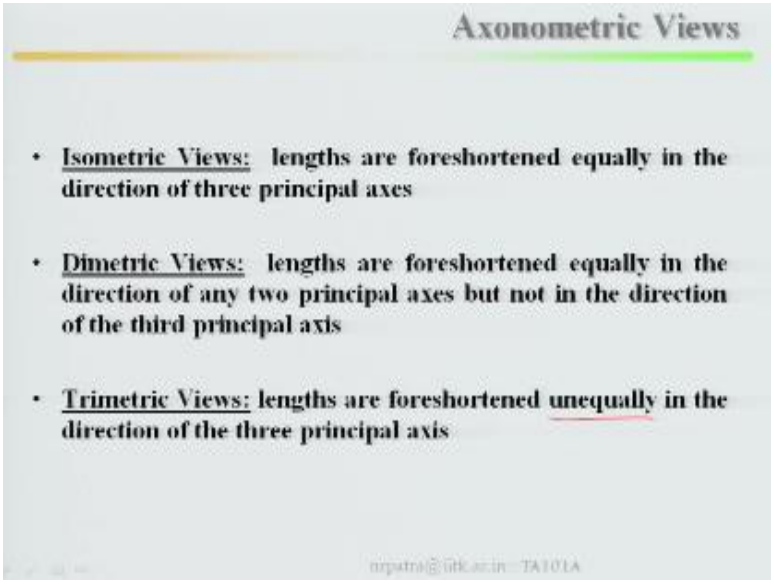

Axonometric views, isometric views lengths are foreshortened equally in the direction of the three principal axes, this please remember and dimetric views, lengths are foreshortened equally in direction of any two principal axes, difference between isometric and dimetric views in isometric views lengths has been foreshortened equally in the direction of three principal axes, and dimetric views lengths are foreshortened equally in the direction of any two principal axes, but not in the direction of third principal axis.

Dimetric views lengths are foreshortened unequally, remember this lengths are foreshortened unequally in the direction of the three principal axes, the difference between isometric and dimetric views, isometric views lengths has been equally foreshortened in the three principal axes that means X, Y and Z, in dimetric views lengths are foreshortened unequally in X, Y and Z direction.

In dimetric views lengths are foreshortened equally in the direction of any two principal axes, for example X and Y equally it will be foreshortened, however in the third axis it is not going to be foreshortened.

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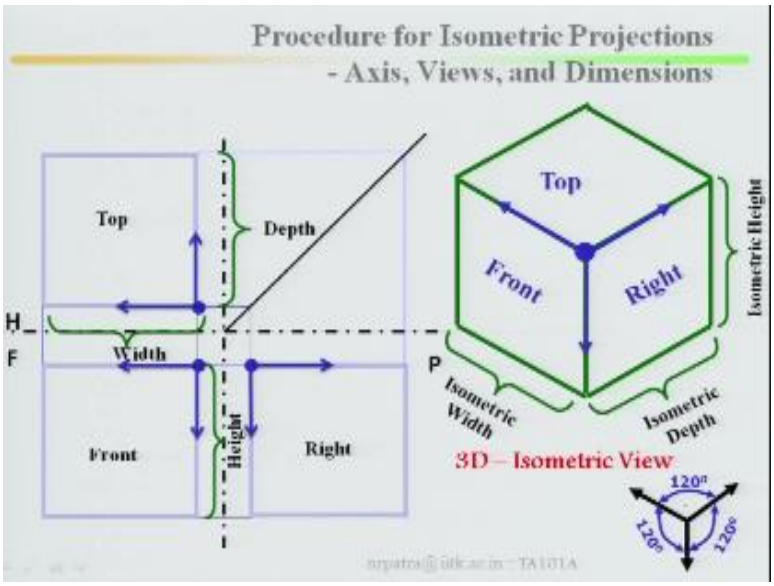

Procedure for the isometric projection, axis, views and dimensions, look at here this is your horizontal plane, this is the case of third angle projections and this is your frontal plane, so this is your top view and this is your front view, this is your profile view and I have marked this points here, then this points has been marked and the axes, principal axes, isometric axes has been marked, it has to be 120° angle it will make 120 angle with each other, so you mark it X, Y and Z look at here.

If I mark it here, this and this it is in the front view, then this and this, this is in the profile view and this and this, this is in the top view. Now in the top view it is your depth and width, in the front view generally height and width and this is the case, depth and width, look at here depth and width, this is your depth and width, then height and width, sorry in the front view it is height and width, in the top view it is the depth and width.

So isometric width, isometric depth, isometric height, this is your front, this is your right side view, this is your top view. So this is your case of your 3D isometric view.

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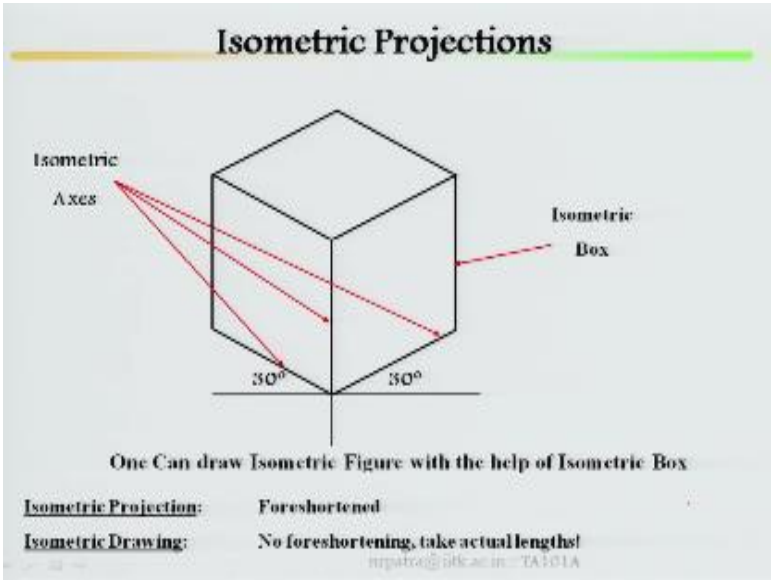

Now how do you start it isometric projections, now prepare isometric box, one can draw isometric figure with the help of isometric box, this is your isometric box then these are all your isometric axes X, Y and Z direction, then isometric projections this is foreshortened by means of equally foreshortened 0.81 times. Isometric drawing no foreshortening, remember this is the difference if sometimes some questions it has been asked go for isometric drawing, in that case it has not been foreshortened, that means all lengths will be equal lengths or whatever in the view this will be equal lengths, that view will be projected as equal lengths.

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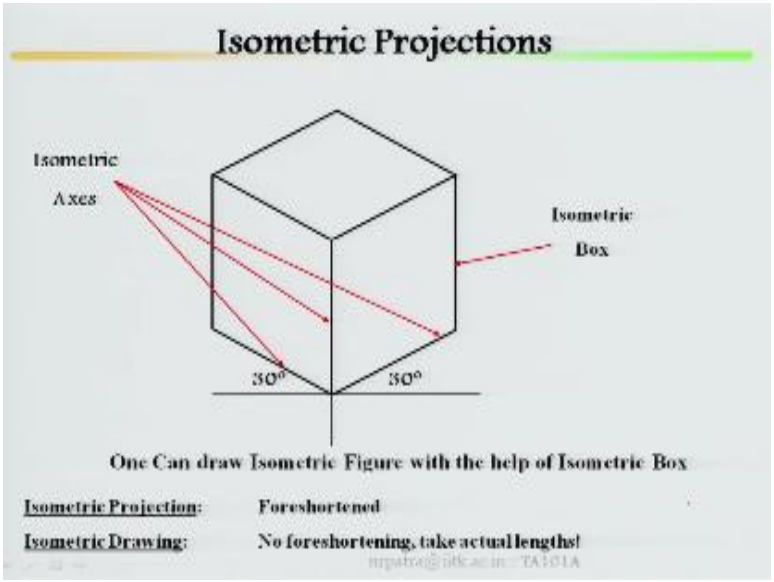

But isometric projections the length will be foreshortened by means of 0.81 times.

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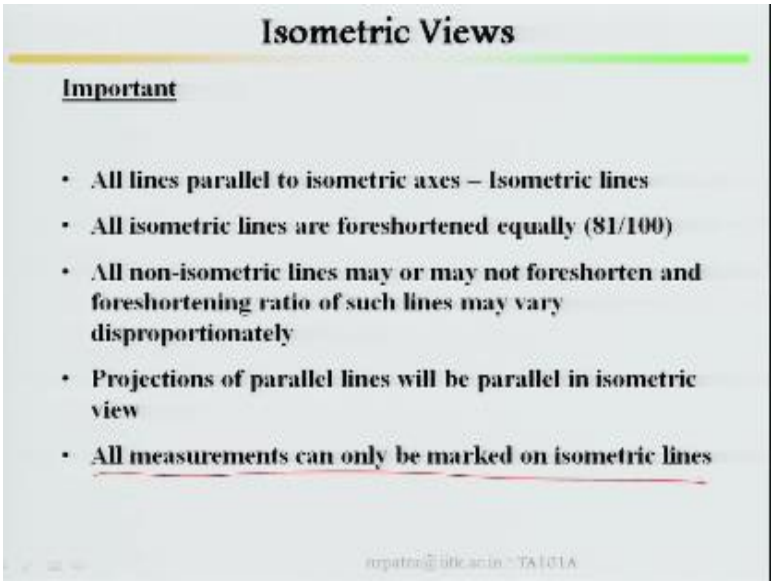

All lines parallel to isometric axes called isometric lines. All isometric lines are foreshortened equally in terms of isometric projections, this is your 0.81 or 81/100. All non-isometric lines may or may not foreshortened and foreshortening ratio of such lines may vary disproportionately. Projections of parallel lines will be parallel in isometric views. All measurement can only be marked on isometric lines. All measurements while doing the dimensioning, all measurements can only be marked on isometric lines.

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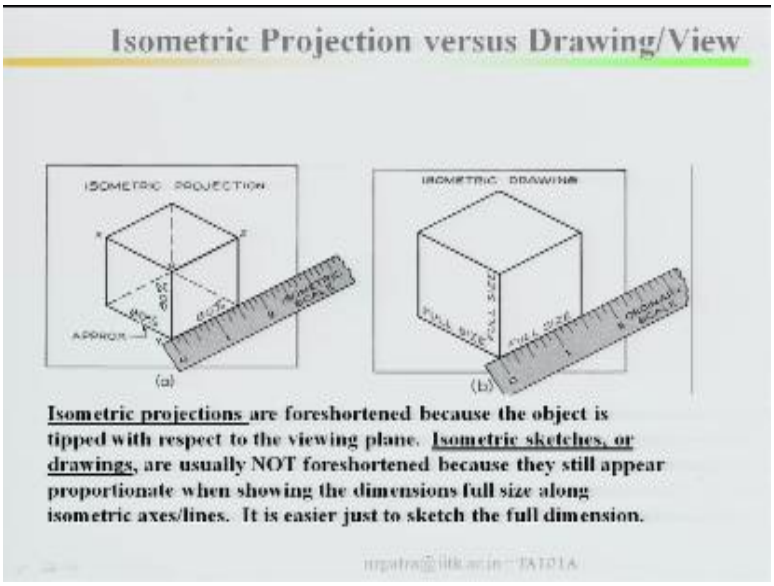

Isometric projections versus drawing or views, look at here this is isomeric projections, this is your isometric drawing or isometric view. Isometric projections are foreshortened because the object is tipped with respect to the viewing plane. How you are viewing, in isometric projections how you are behaving depending upon that it has been foreshortened, so isometric sketches or drawings are usually not foreshortened because they will appear proportionate when showing the dimensions full size along isometric axis or lines. It is easier just to sketch the full dimensions.

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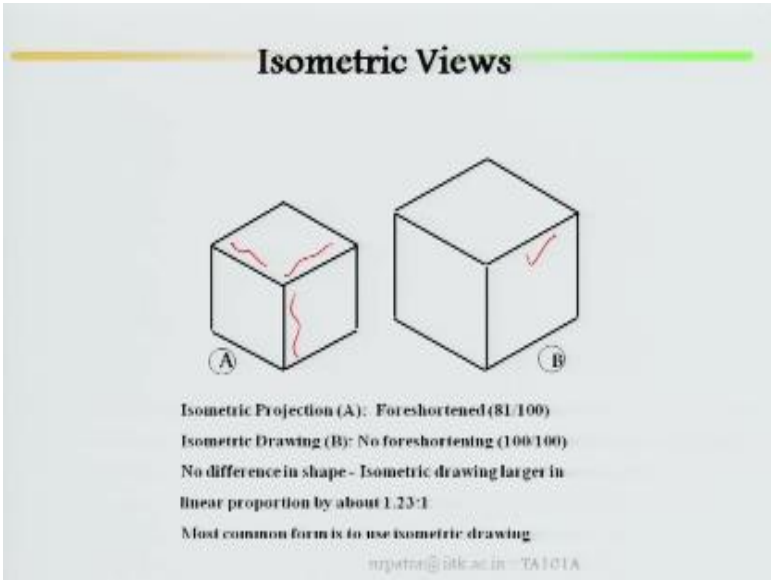

So A is your isometric projections or isometric projection of a cube, that means equally length width and height equally it has been foreshortened, but B is your isometric view not foreshortened, it is 100/100 what is the exact length it is there that length.

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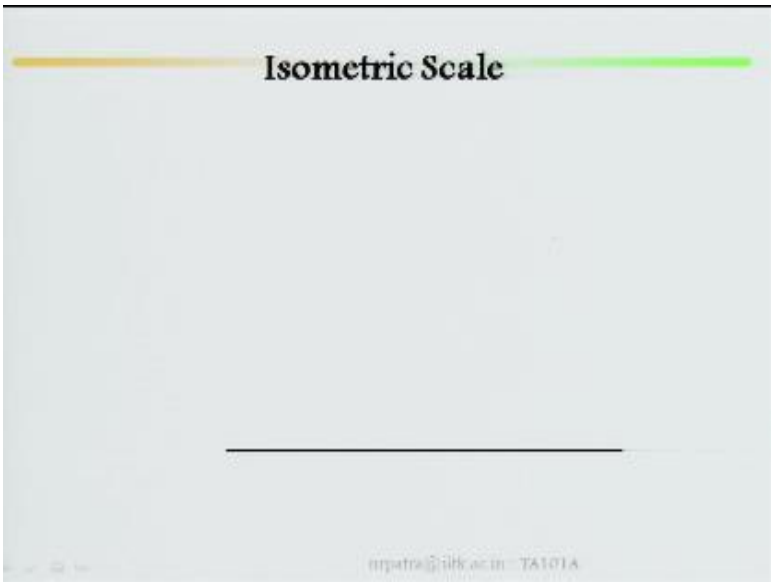

Now to do this you have to prepare a isometric scale, for preparing this isometric scale in the drawing you cannot use the calculators for foreshortening the lengths, all lengths in three directions by 0.81 times you cannot do it by means of calculator, rather you have to do prepare by means of drawings.

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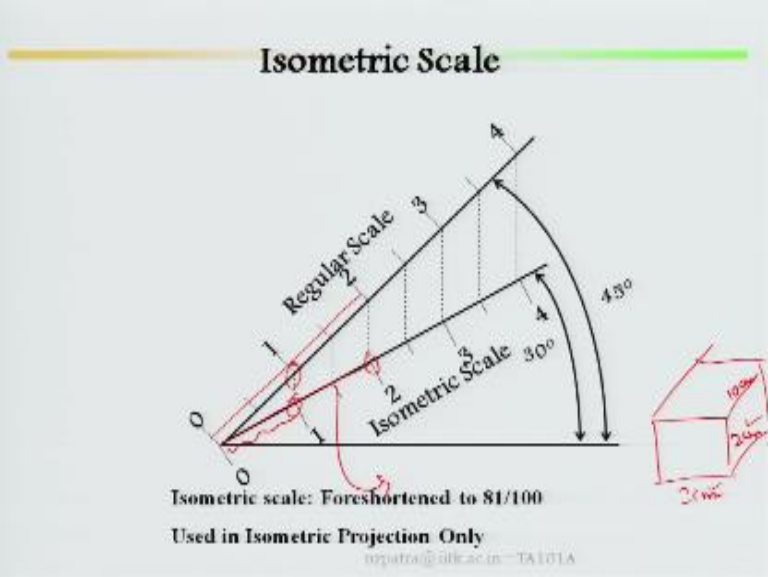

So prepare your isometric scale before going for isometric projections, so at 45° this is your normal scale 01234 you mark it with your scale, one centimeter you can mark it, one centimeter is equal to one meter length, this is one is to one scale you can plot it or one is to ten depending on that 01234. Then this is your regular scale, then go to isometric scale prepare it at an angle 30°, then from there from the regular scale you project it back, project it back and this will be giving suppose you are giving you, your regular scale is one centimeter that means you mark it one centimeter.

Then our this point has been projected back to this point, so if you take it 0 to 1 in your isometric scale here this is your regular scale, and this is your isometric scale automatically it has been reduced to 0.81 times. So for example means this isometric scale how you are going to prepare, suppose there is a cube, for example if it is not a cube it is any shape maybe in the depth directions, in the depth directions.

Suppose this is your, this is your, you can say that this is your two centimeter, this is your two centimeter then this is your ten centimeter in the depth directions, so this ten centimeter, this is your largest dimensions in depth directions, that dimensions you have to take in the regular scale.

Then with the regular scale you convert it into isometric scale that means once you have taken the largest dimensions ten centimeter in the regular scale, it is obvious that two centimeter and two centimeter will come into in the regular scale.

If you take two centimeter in the regular scale then latter part it will be very difficult to foreshorten your ten centimeter. So first you prepare isometric scale depending upon the dimensions, then from the isometric scale while doing the isometric projections you take the dimensions, suppose in isometric scale it is two centimeter that means in regular scale where is your two centimeter, this is my two centimeter.

So this has been projected back, so this to this dimension is your isometric projection scale, it is reduced by 0.81 times. So prepare your isometric scale first starting your isometric projections, so it has been foreshortened by 81/100 or 0.81 times used in isometric projections only.

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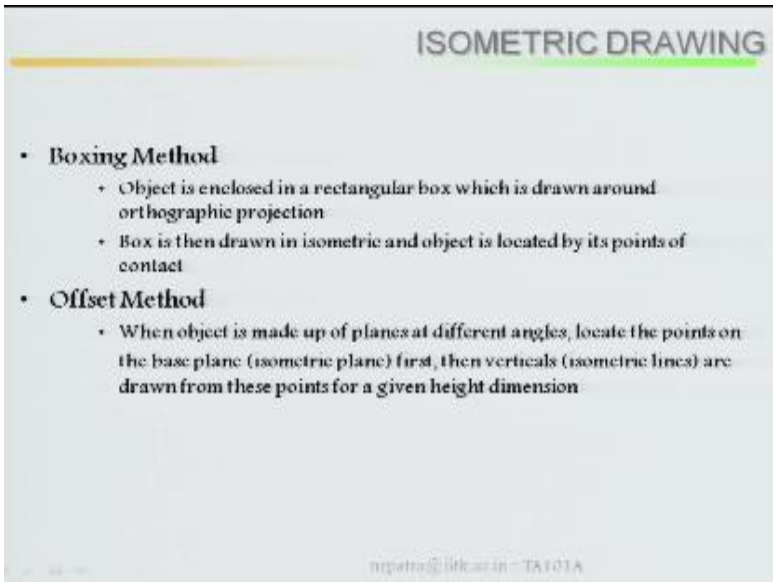

Isometric drawing, how you are going to start it by means of boxing method, object is enclosed in a regular box which is drawn around orthographic projections, by means of boxing method it has to be enclosed, that means object has to be enclosed in a regular rectangular box which is

drawn around orthographic projection. Then box is then drawn in isometric and object is located by its points of contact, we will explain.

Offset method, in offset method when object is made up of planes at different angles locate the points on the base plane that means isometric plane passed, then vertical isometric lines are drawn from these points for given height dimensions. These are the two methods, one is your boxing method, other is your offset method to draw your isometric projections.

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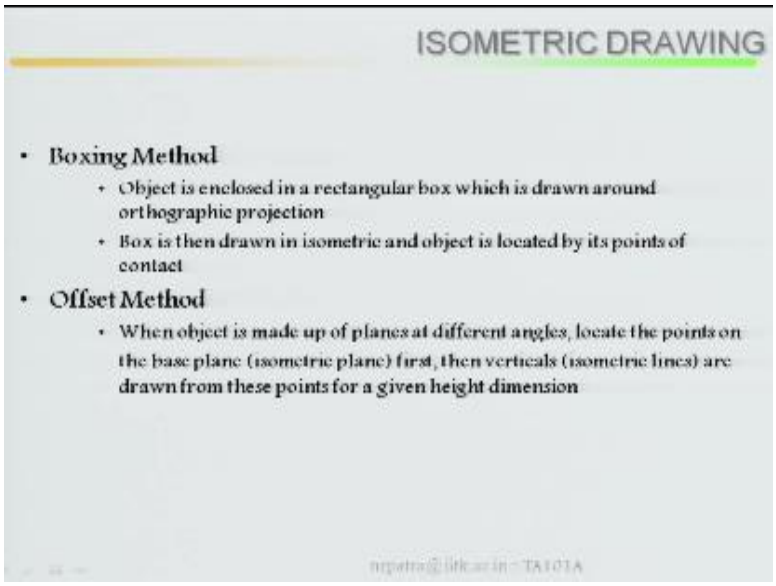

So next we will start it this is all about basics of isometric projections, next we will solve few examples by means of isometric scale, as well as by means of boxing or offset methods.

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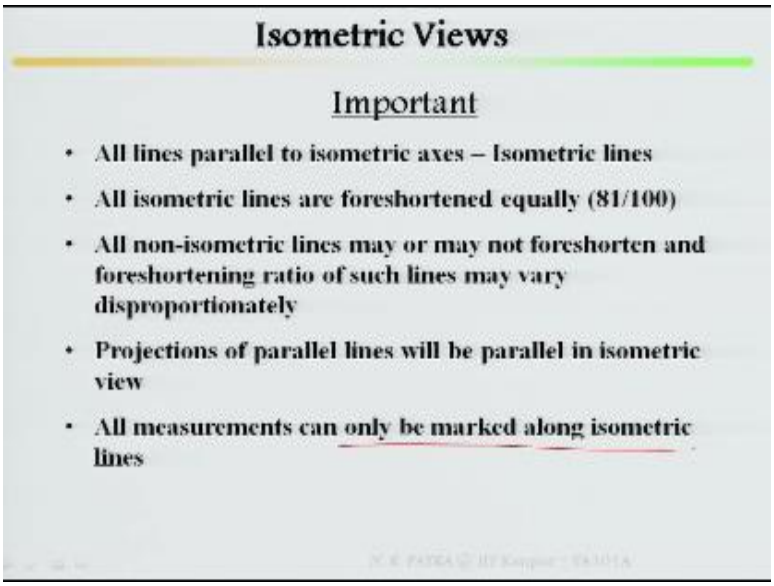

So isometric views what I have covered till now, all lines parallel to isometric axis is called isometric lines. All isometric lines are foreshortened equally, remember this for isometric projections. All non-isometric lines may or may not foreshortened and foreshortening ratio of such lines may vary disproportionately. Then projections of parallel lines will be parallel in isometric view. All measurement can only be marked along isometric lines, for dimensioning all measurements can only be marked along isometric lines, while doing the dimensioning or dimensions can be marked along the isometric lines, this is your important points you keep it in your mind.

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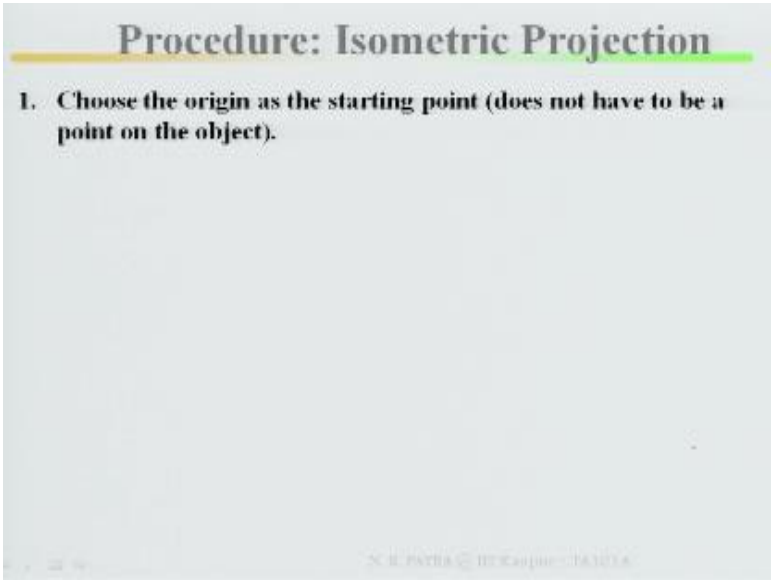

Then you start with your procedure for isometric projections, choose the origin as the starting point, does not have to be the point on the object, remember if there is a object not necessarily any point in the object it can take as origin not necessarily, you choose the origin as the starting point.

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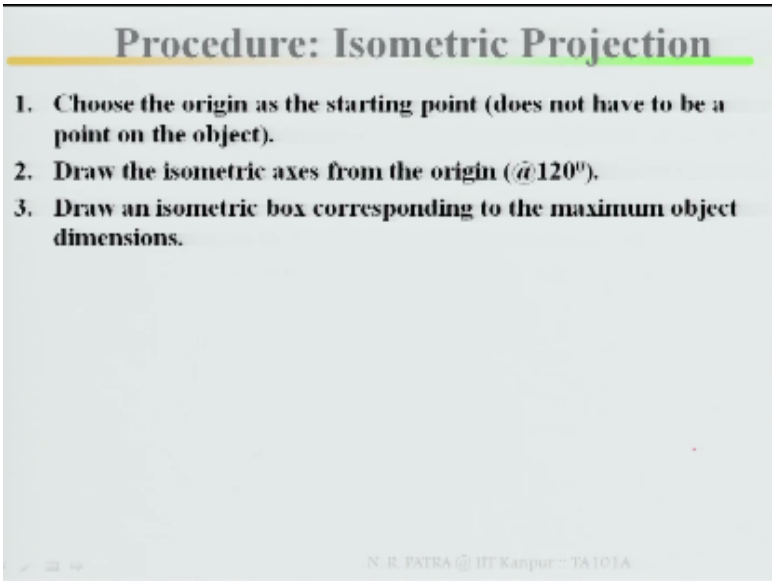

Draw the isometric axis from the origin at an angle of 120° X, Y and Z. Then draw an isometric box corresponding to the maximum object dimensions, as I said what is your maximum object dimensions, in X-direction in Y direction as well as in Z directions, then draw an isometric box corresponding to the maximum.

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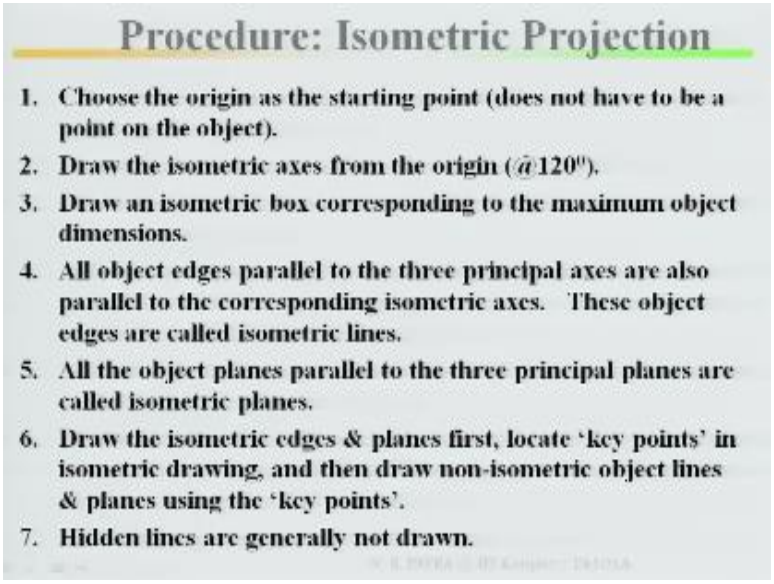

Object dimensions. All object edges parallel to the three principal axis are also parallel to the corresponding isometric axis, these object edges are called isometric lines. All the object planes parallel to the three principal planes are called isometric planes. Draw the isometric edges planes first remember, draw the isometric edge and planes first, locate key points, locate key points in isometric drawing then draw non isometric object lines, planes using the key points. So hidden lines are generally not drawn, hidden lines as far as possible in case of isometric projections are not drawn.

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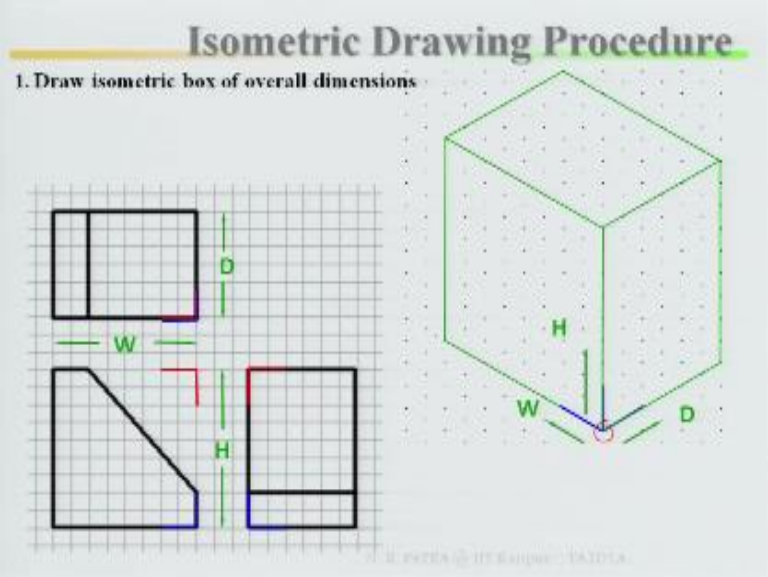

Let us start isometric drawing procedure, this is your views top, front, as well as side views, then take the grid lines, draw first, first principal is draw isometric box of overall dimensions, that means overall dimensions means these dimensions you measure, these dimensions you measure, then these dimensions you measure, start with this, see the dimension I have marked, then again bottom part it has been marked, choose your, choose your origin, the origin has been, it has been chosen then, this is what, width directions, this is your width directions.

So in the top view this is your width, so choose it and you take it this is your width direction, draw it and take it what is your largest dimensions, in the width direction this is your largest dimension, you take it. Then height directions, height is your vertical here, you can take it this is your height and take your largest dimension here, draw it, then finish it width and height, then depth directions. Obviously this is your depth directions, you take the largest dimension then finish your cube, this is your isometric box, this is your isometric box, first what I have

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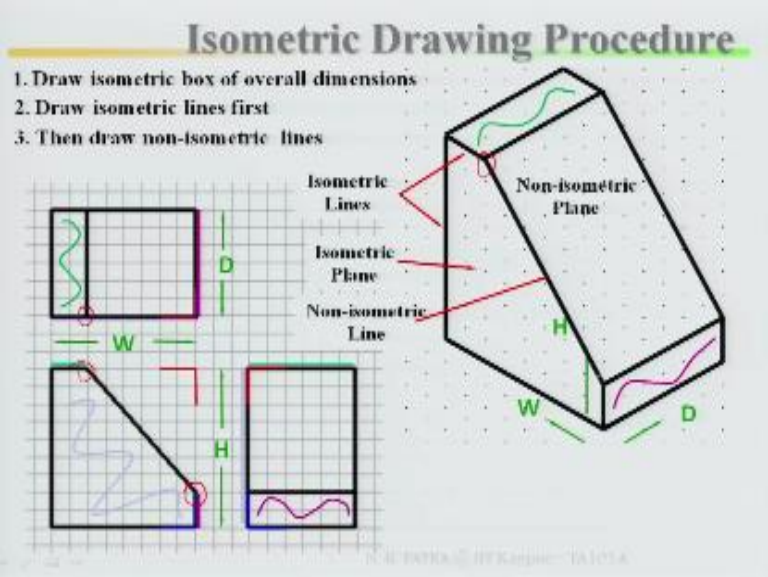

Done it generally you mark your top view, front view, and side view and measure your dimensions largest dimensions in depth, width and height directions and choose your origin any point draw the grid lines to the origin, from with respect to origin draw the three principal axis, isometric axes, this angle has to be prepared with your 120 ° or you can do it, you can take it here then you can prepare your 30°, 30° or you can take it this directions you can prepare it then once choose your origin and draw the width directions, then depth directions, then height directions, complete your isometric box first.

So isometric box has been completed, then draw isometric lines first, isometric lines first then we will go, in width directions, in width directions these dimensions you draw it. Similarly in height directions you take the dimension, then what happen, in again width direction these are all your called isometric lines, this is your width directions, this is your height directions, these are all your isometric lines, then this is called your isometric plane, then draw non isometric lines, what are your non isometric lines, if I take it from here to here in height directions.

I will find it out this point, I cannot draw the non isometric lines rather I marked the points along the isometric lines. What are the points are there? From here to here in height direction in front

view this point has been located, from here to here in width directions at the top view this point has been located. So this point has been located and this to this line if I draw this is your non isometric lines. So locate the points then draw your non isometric lines, this is your non isometric lines, then similarly take other part, one by one you take other part and finish this box, mark the points first then do it, do it, finish it up by means of your SV pencils because this is your, this is your object line drawn, this is your particularly your construction lines, means object lines.

So this is your construction lines, this is your object lines, it has to be marked by means of HB pencils, then this plane, this plane is called your non isometric plane. Then once you draw your object lines, then construction lines slowly, slowly raise it or you can put it with a lighter mark if this is your construction lines. If I take it out how it looks, this is my object, this is your isometric drawing. Now there are two difference, one is your isometric projection other is your isometric drawing or isometric view.

If it is your isometric drawing or isometric view, first of all for both the cases forget about isometric drawing or isometric projections for both these cases this is your procedure you have to draw, draw the isometric box first to clear your overall dimensions, that means largest dimensions.

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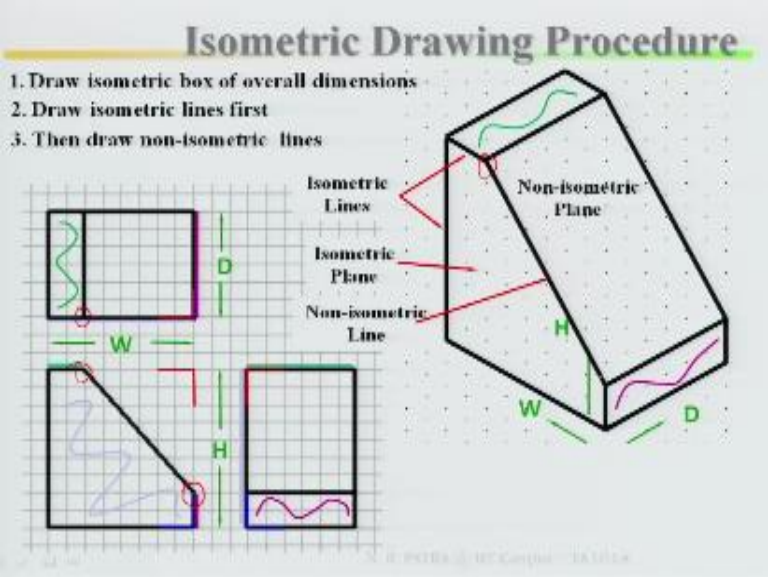

In width, in height direction, as well as in depth direction finish your isometric box first, then draw your isometric lines, then draw non isometric lines by marking points along the isometric lines.

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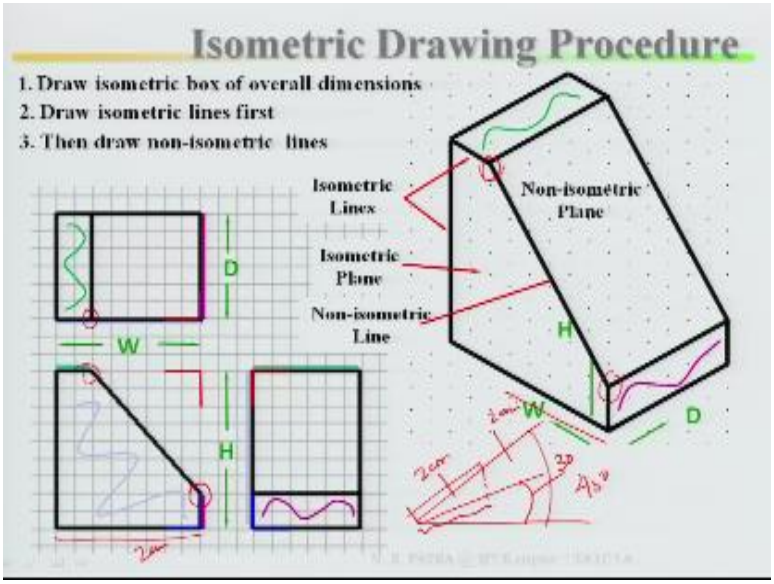

Marking the points, then draw your non isometric line as well as non isometric plane. Then, then there are isometric view, then there are isometric projections. In case of isometric projections this length particularly width, height, and depth it will be foreshortened equally by means of 0.81 times. So then you have to draw your isometric scale, with respect to isometric scale suppose this is your two centimeter from there, from there this is your regular scale 45° then this is your 30° with this is your 30° then you draw this scale, suppose these to this is your two centimeter from there you project it back, this is your reduced scale of your two centimeter.

So width with directions then you mark your two centimeter. Similarly height direction you mark because it has to be equally foreshortened, then this view will become a isometric projections. So isometric view there is no foreshortened, isometric projections there is a foreshortened of all along three axis, X, Y and Z directions. This is all about how to start isometric drawing the procedure.

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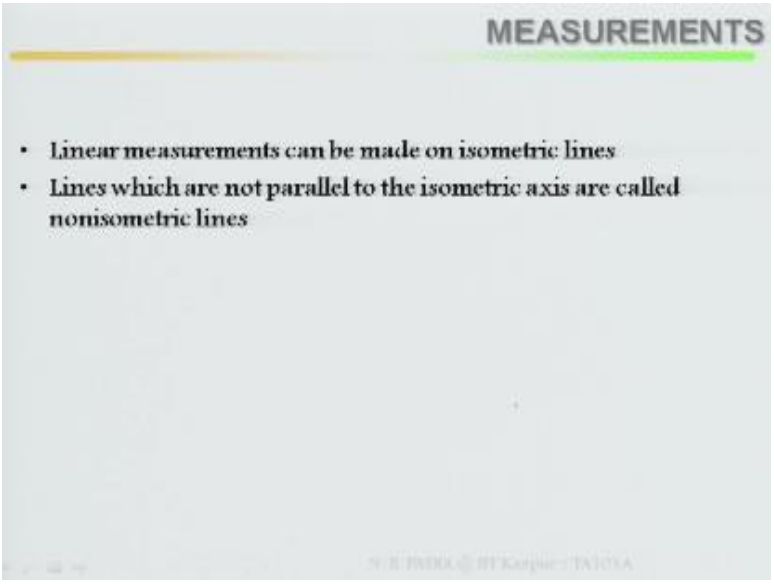

Measurements, linear measurements can be made on isometric lines, then lines which are not parallel to the isometric axis are called non isometric lines. Lines which are not parallel to the isometric axis are called non isometric lines.

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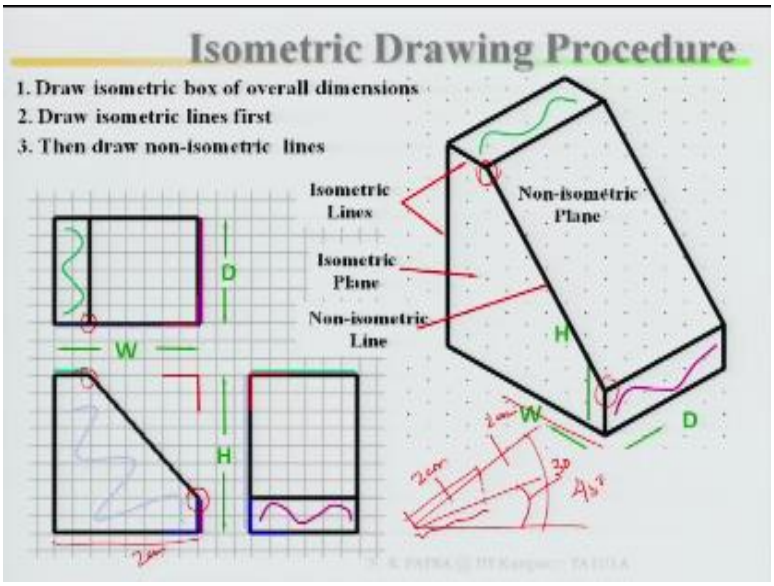

Here lines which are not parallel to your isometric lines these are a non isometric lines.

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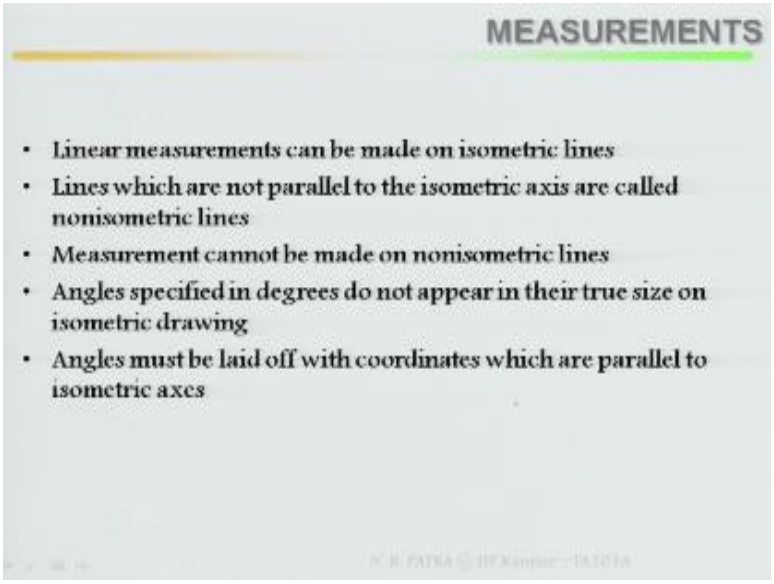

Measurement cannot be made on non isometric lines, remember you cannot measure along your non isometric lines. Angles specified in degrees do not appear in their true size on isometric drawings. Angles must be laid off with coordinates which are parallel to isometric axes. This is all about your measurement, so measurement cannot be made on non isometric lines. So in summary measurements, isometric measurement can be made on isometric lines, remember measurements cannot be made on non isometric lines.

So this is all about isometric how do you start it, so next class I will start by means of boxing method where origin is not an object, few examples we are going to solve it, and step-by-step boxing method as well as offset method will complete your isometric view as well as isometric projections. Thank you.

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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
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