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

Lecture – 03
Geometric Constructions-Part II

by
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Department of Civil Engineering, IIT Kanpur

Last class we had finished

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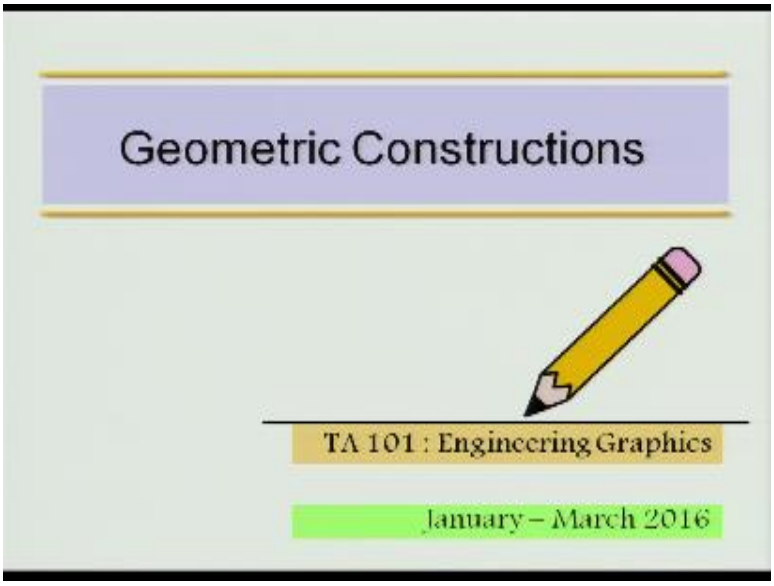

Some part of Geometric constructions

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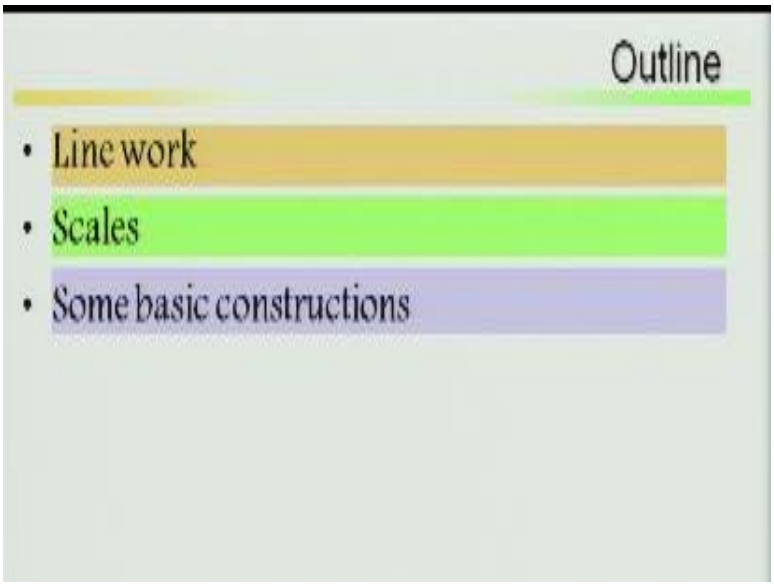

Line work and scales it has been covered.

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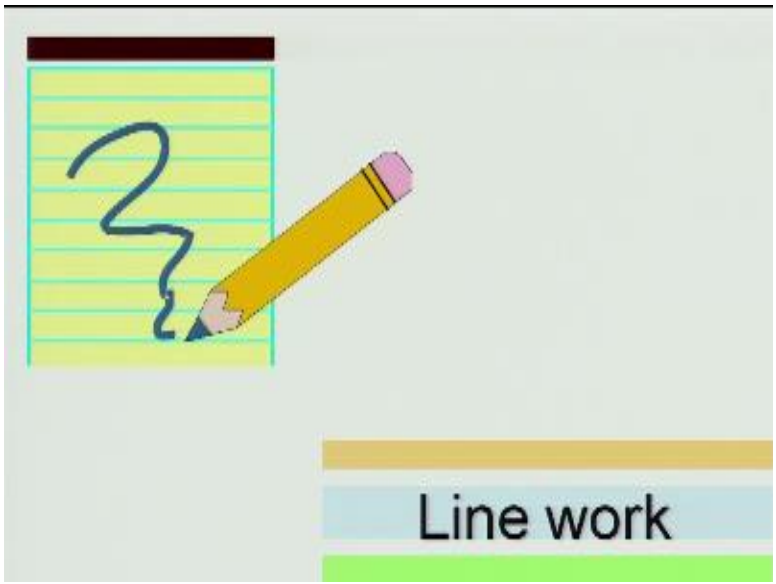

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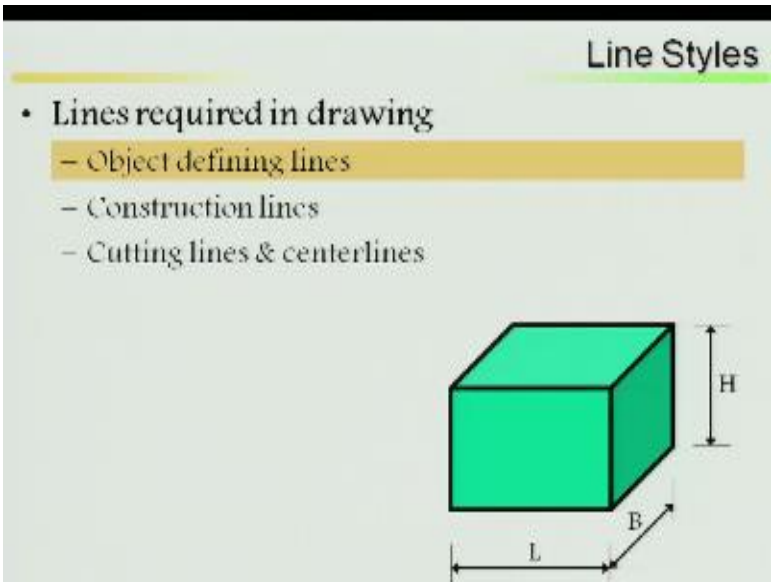

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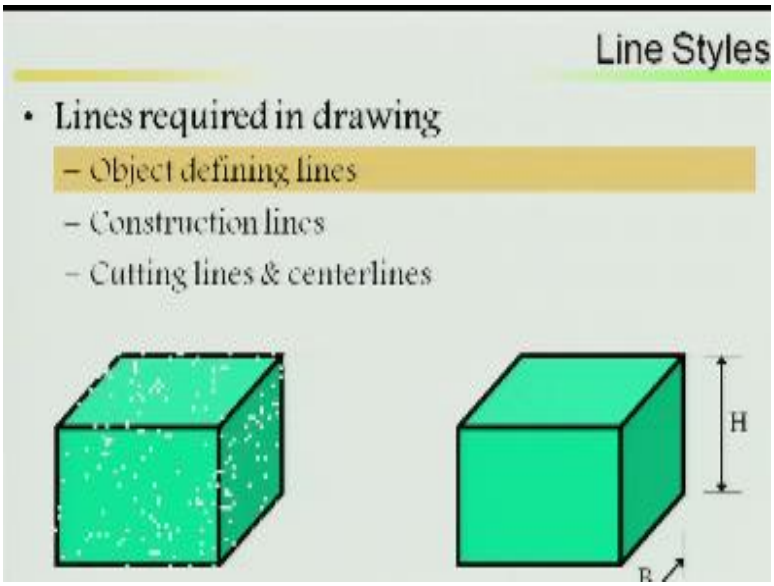

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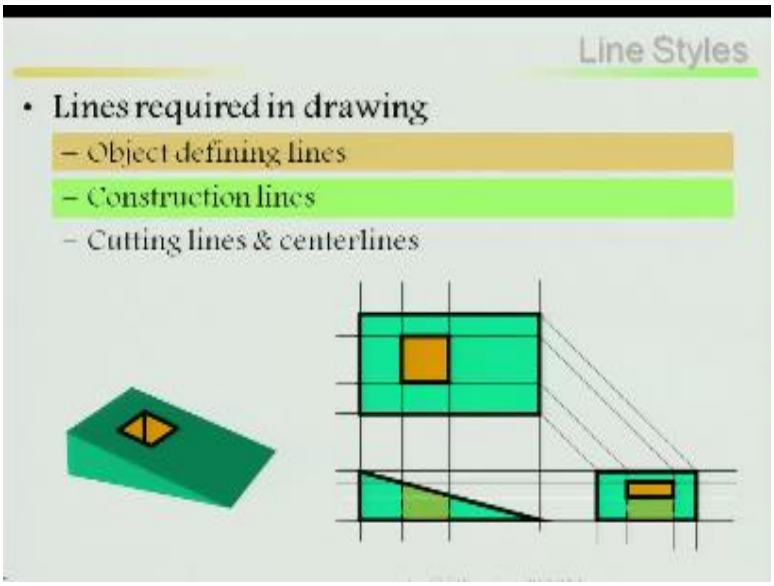

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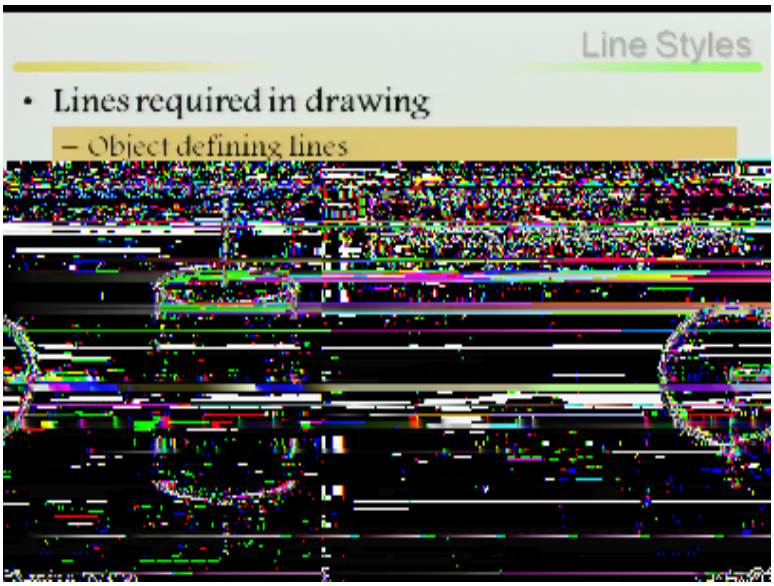

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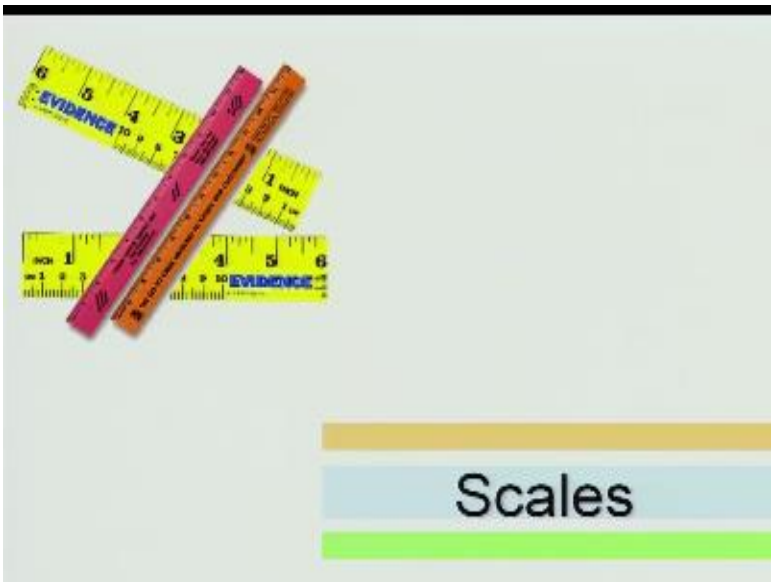

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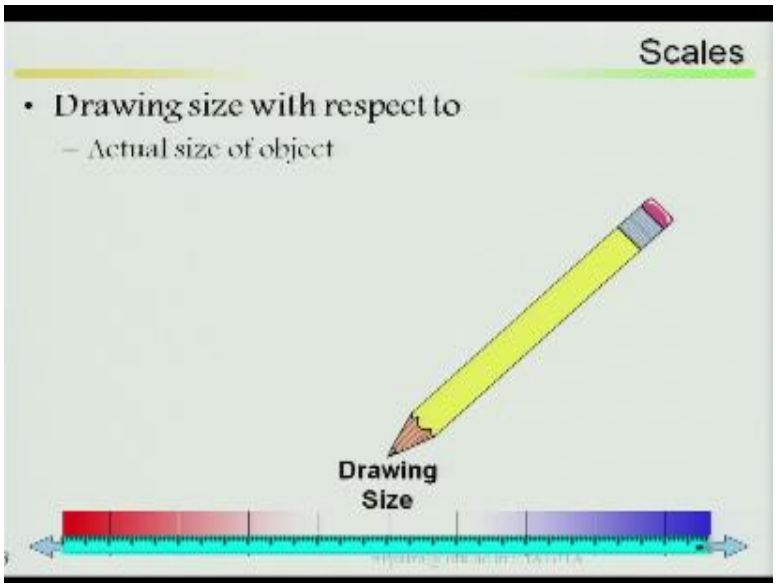

So basic line styles and scales enlarged scales and reduced scales.

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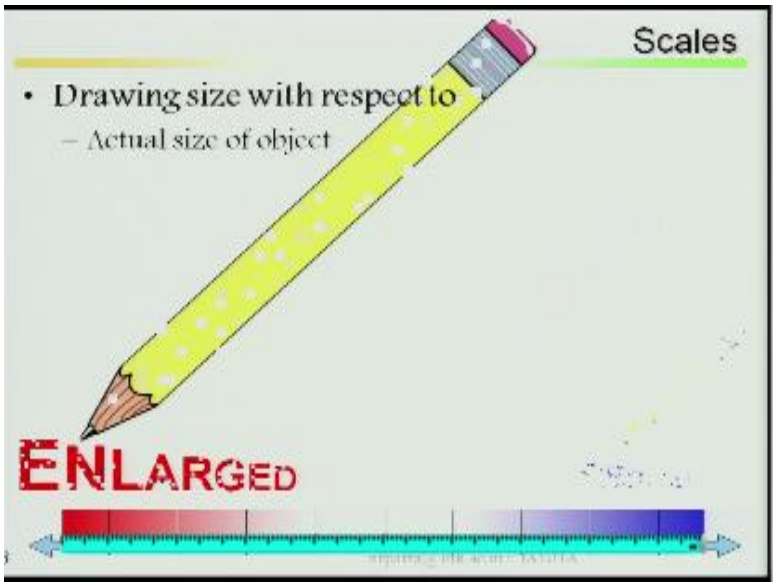

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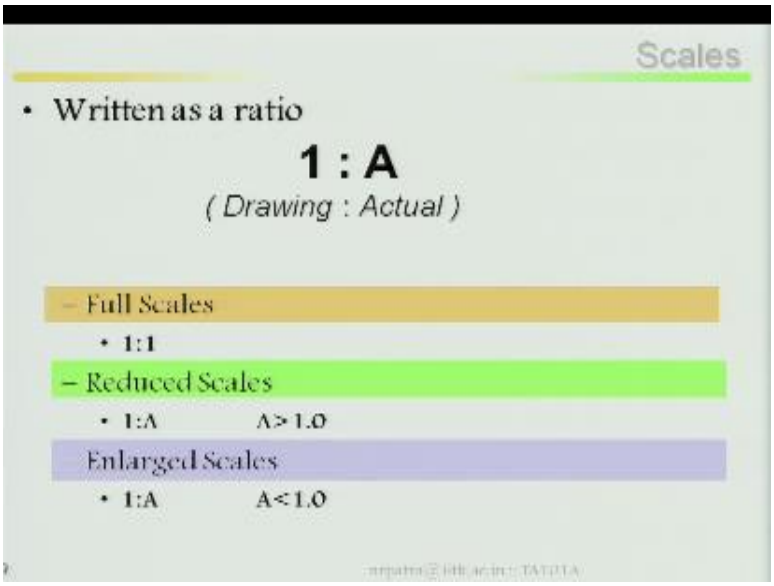

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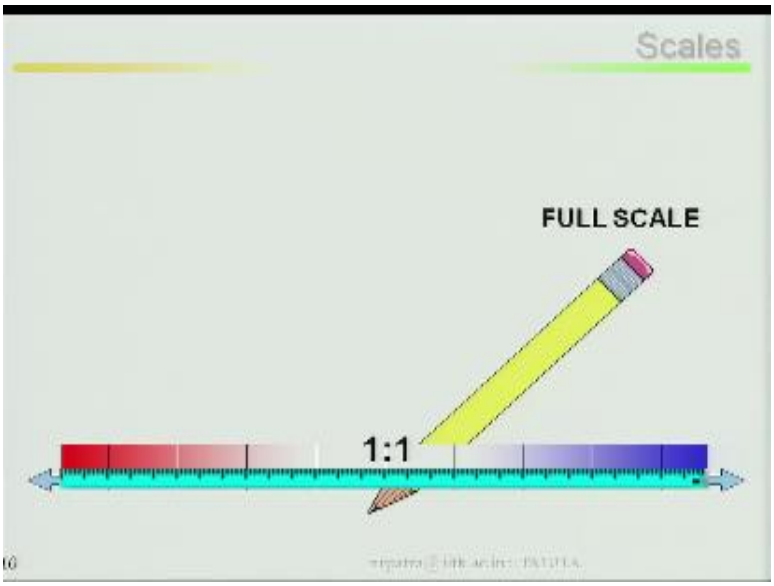

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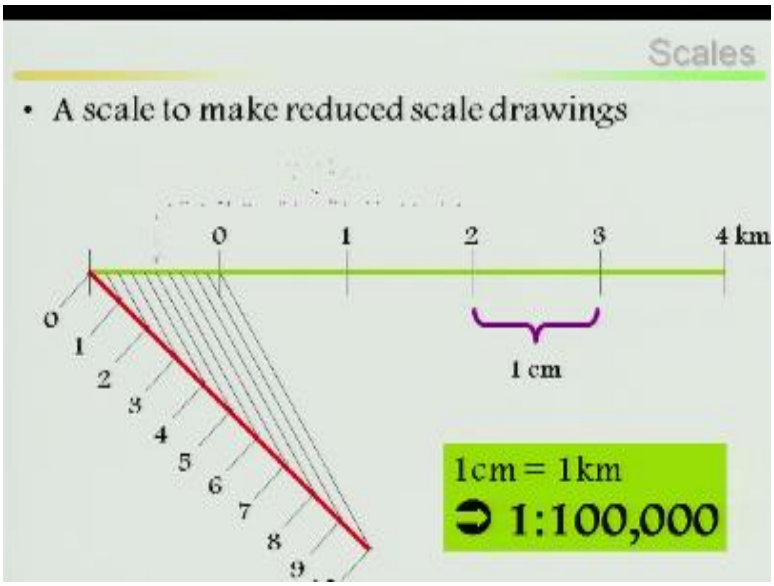

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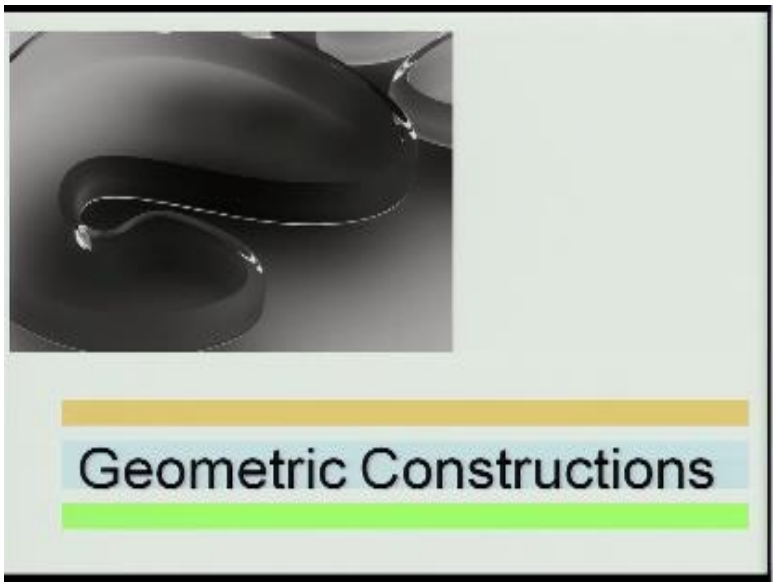

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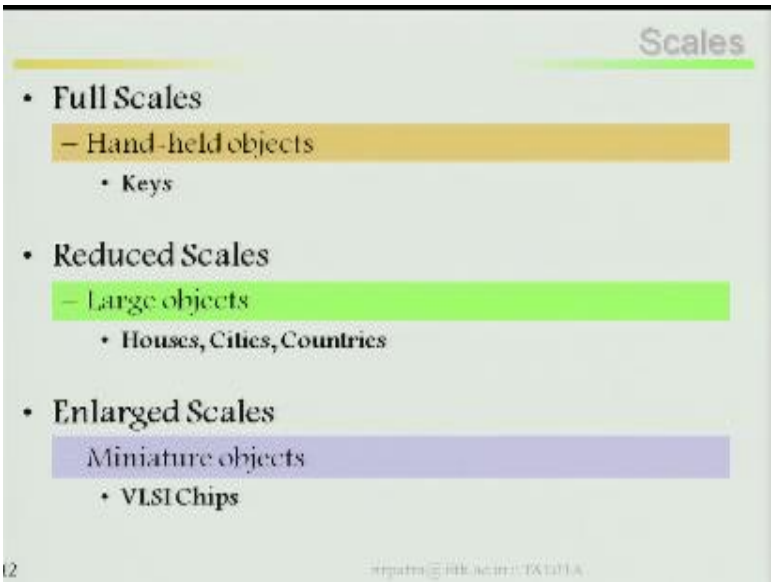

Then how to convert in a drawing with a reduced scale, now let us start with geometric constructions. So definition of geometry types, lines, planes, solids, doubly curved surfaces and objects.

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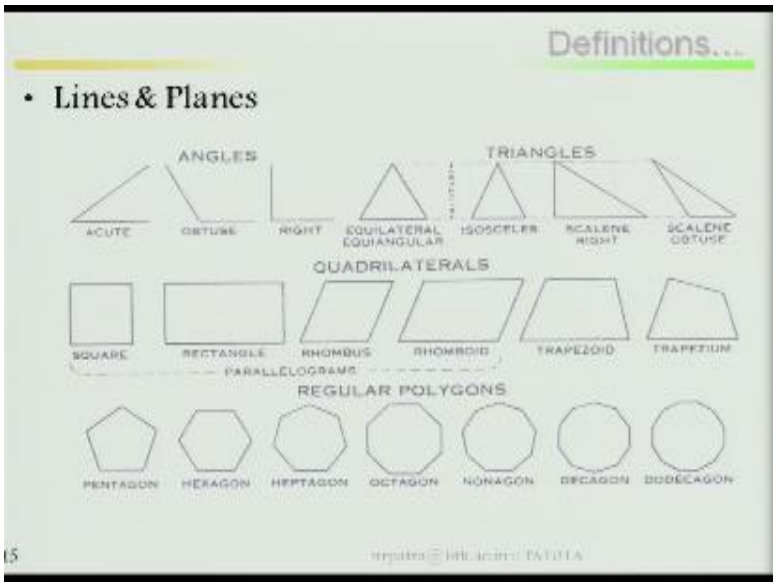

Lines and planes, acute right angle, equilateral triangle, these are all lines.

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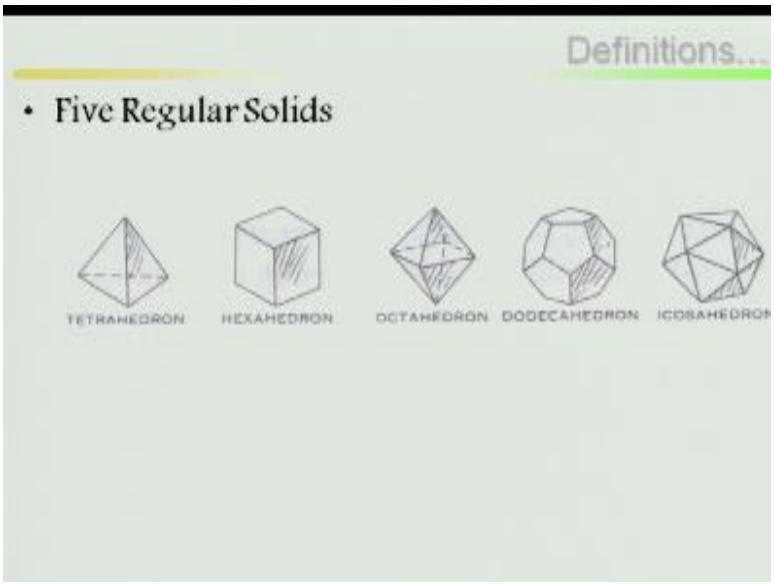

And five regular solids, tetrahedron, hexahedron, octahedron, dodecahedron, icosahedrons.

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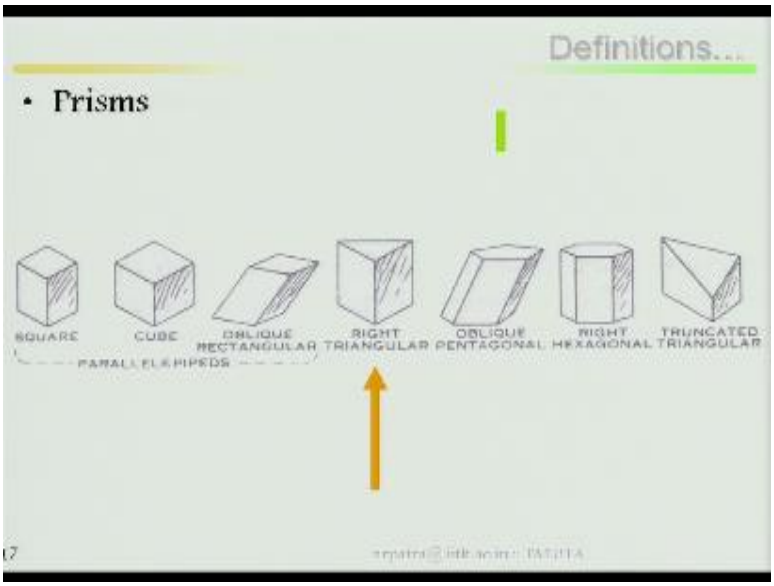

And prisms

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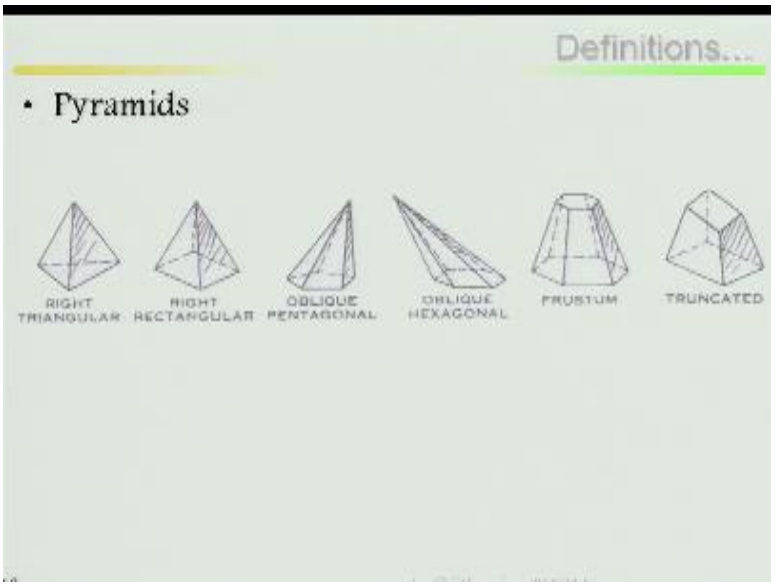

Then pyramids.

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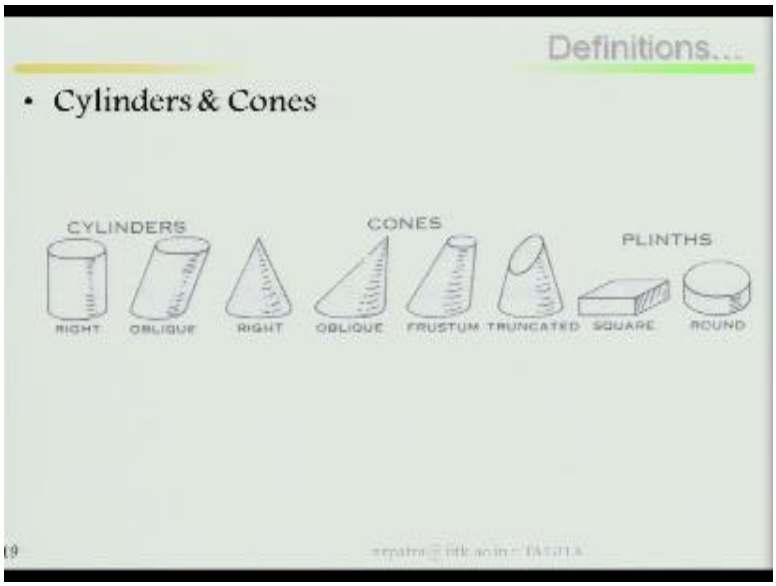

Cylinders and cones.

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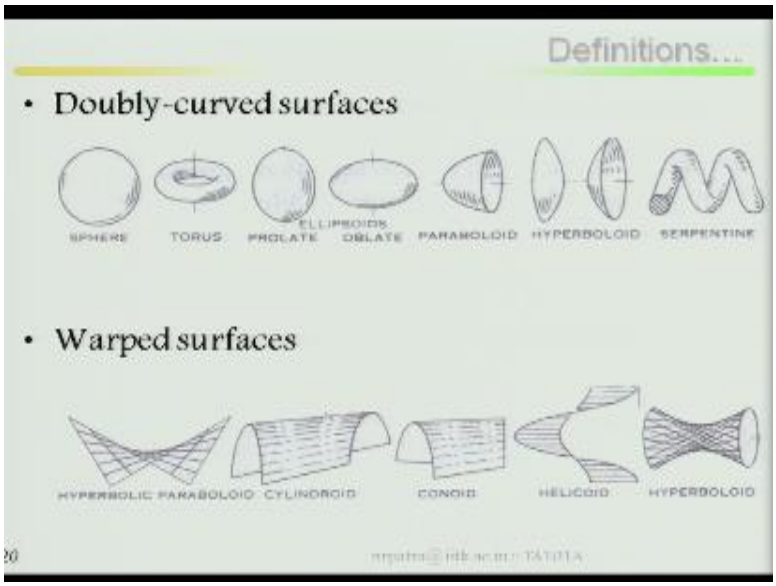

Doubly curved surfaces, warped surfaces.

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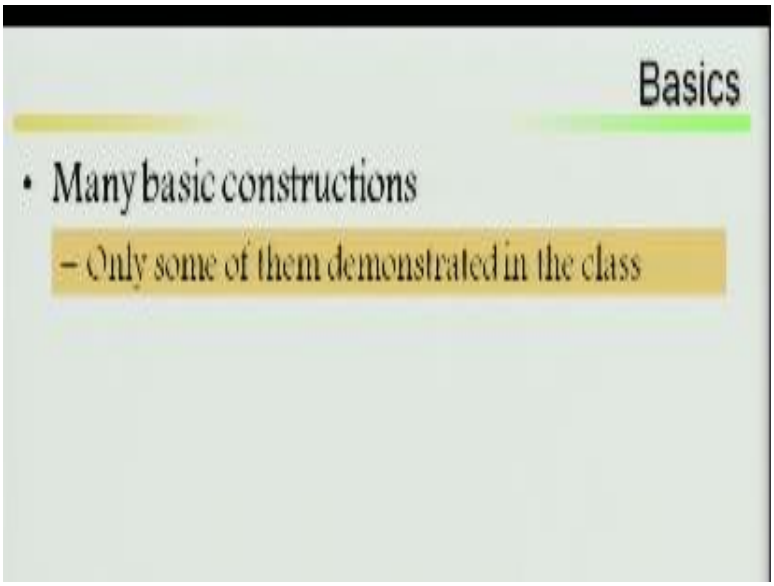

Many basic constructions are there, only few I just explain, rest you can try at your home.

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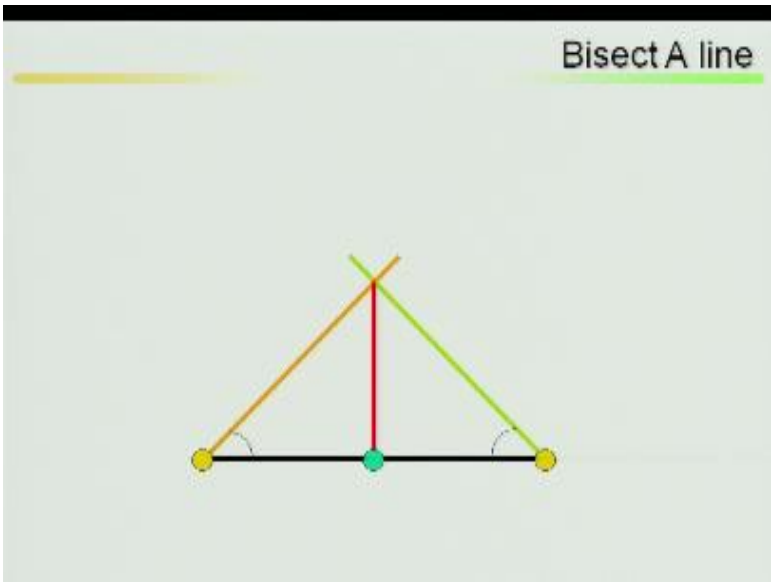

For example how to bisect a line, consider a line and take it, make an angle, join it, then bisect it.

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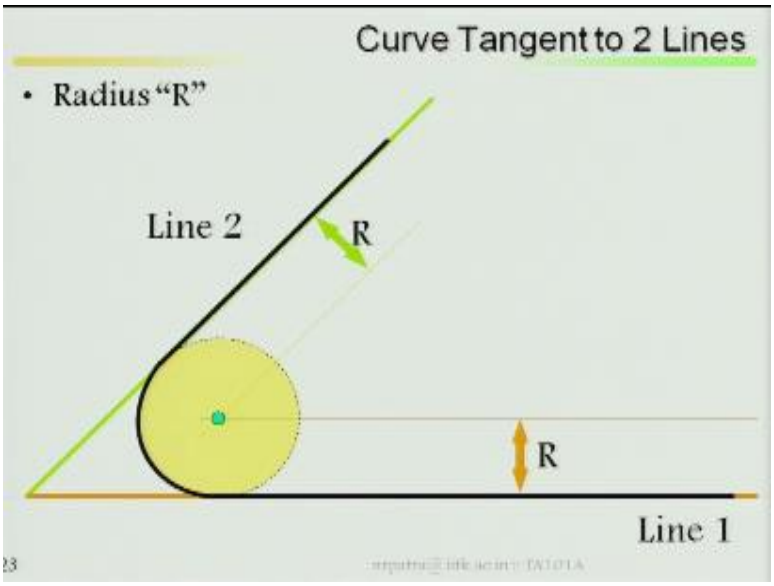

Then curve tangent to two lines, look at here line 1 and line 2 then our R do it, mark the points, then draw the curve, then your tangent.

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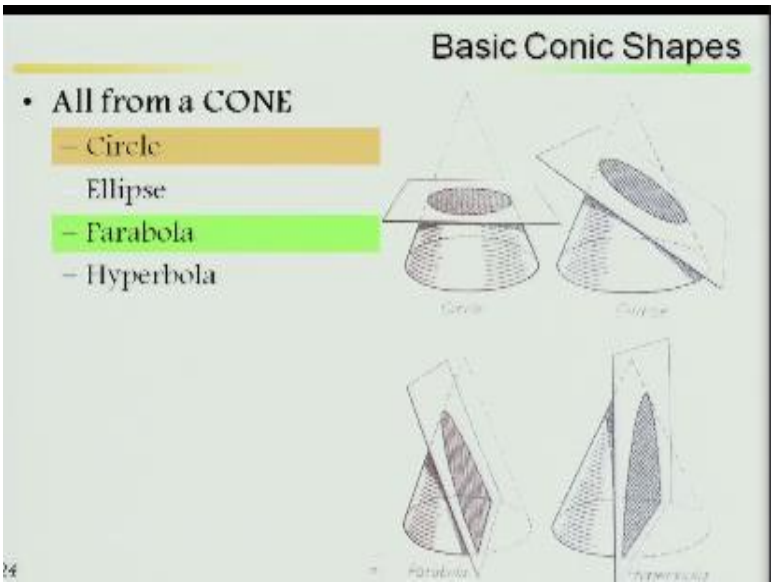

Then basic conic shapes all from a cone, hybrid is a circle, if I go with this if I make it, cut this cone here I can get a circle, if I certain inclination it will be resulted either ellipse, parabola or hyperbola.

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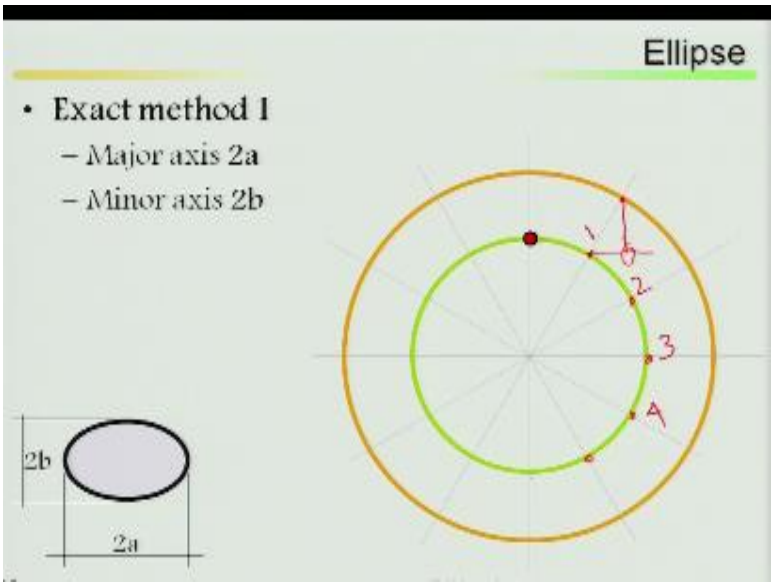

Now for construction of ellipse there are three methods, first one is your exact methods, supports major axis 2a and minor axis 2b has been given, how you will do? Considering major axis first you draw first concentric circle, suppose let us say this is your major axis of your 2a, then considering minor axis of 2b second concentric circle draw it, then divide it into equal number of parts.

Then after division mark the points of your minor axis 1, 2, 3, 4, 5, 6, 7, 8 like this, then considering suppose this is my point 1, 1, 2, 3, 4 like this, considering point 1 draw here parallel to your major axis, from this point draw parallel to your minor axis and you will get the requisite point, if I make it.

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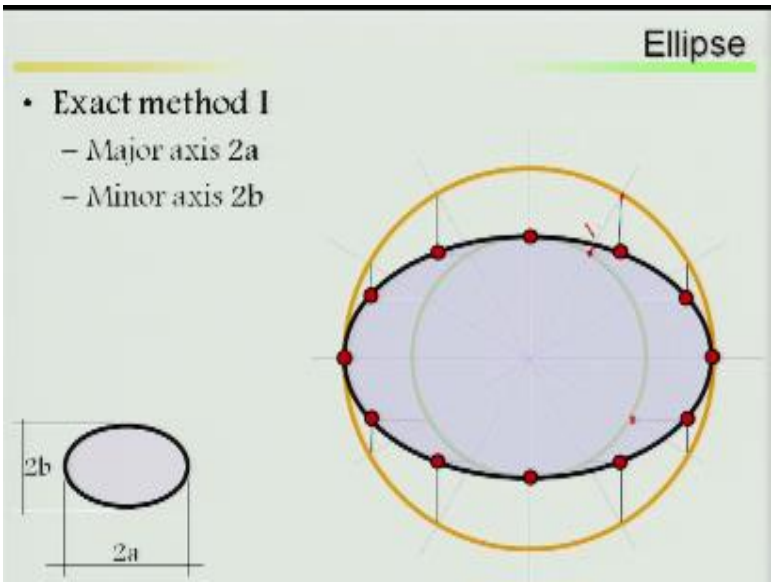

With this look at here, here, here, then point has been located, similarly you construct other part 1.2, 0.3 will be here, 0.4, 0.5, 6, 7, 8, then draw by smooth lines, draw by the smooth lines then it comes here ellipse, construction of ellipse.

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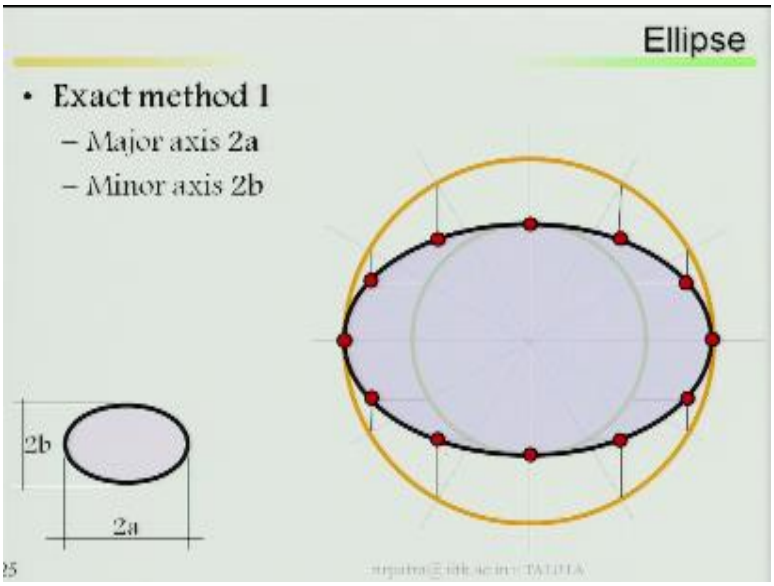

Once again let me repeat it, major axis has been given 2a, minor axis 2b has been given. Considering major axis draw the concentric circle, then considering minor axis draw the circle 2b, then divide into equal number of parts, here I divide it, then mark the points in your minor axis circle my circle, then considering with this minor axis then draw the intersection points, then after drawing the intersection points draw a smooth line or smooth curve by joining point-to-point draw a smooth curve, this gives one ellipse and this method call exact method. There is a prove also.

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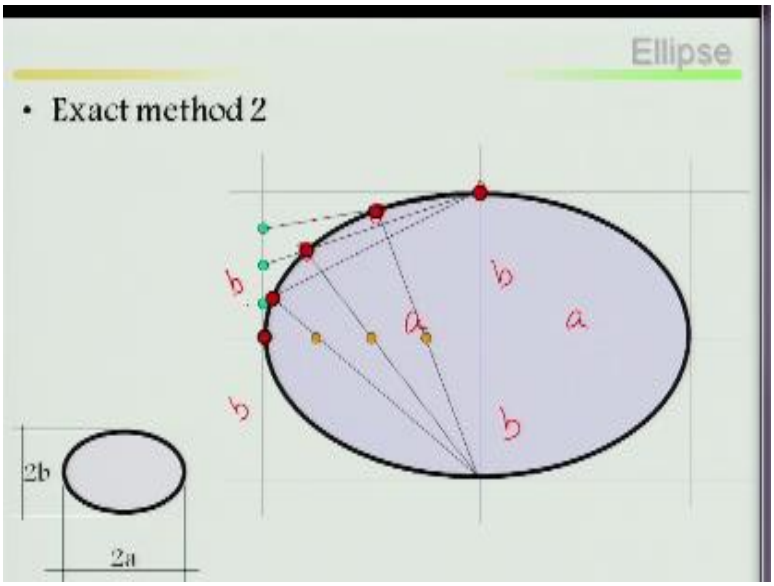

Now second part is your exact method 2, prepare it, major axis set take it major axis 2b, 2a and minor axis 2b. So this will be my 2a that means this is a, this is a, this is b and this is b, b and this is b. Then first you divide it into four parts, first one part you finish it, then you can superimpose it other parts. So divide it into equal number of, here from here to here a, equal number of parts, 1, 2, 3 equal.

Then similarly b equal number of parts, then join with this corner to your b, then from here join considering point this point 1, 2, 3 join it where this intersection points, intersection points look at here point 1, then here 2, then here 3, then here 4, mark these points. Now1, 2, 3, 4, 5, then once you do it here then you superimpose, this side will be this side, other part of this, then you finish your ellipse.

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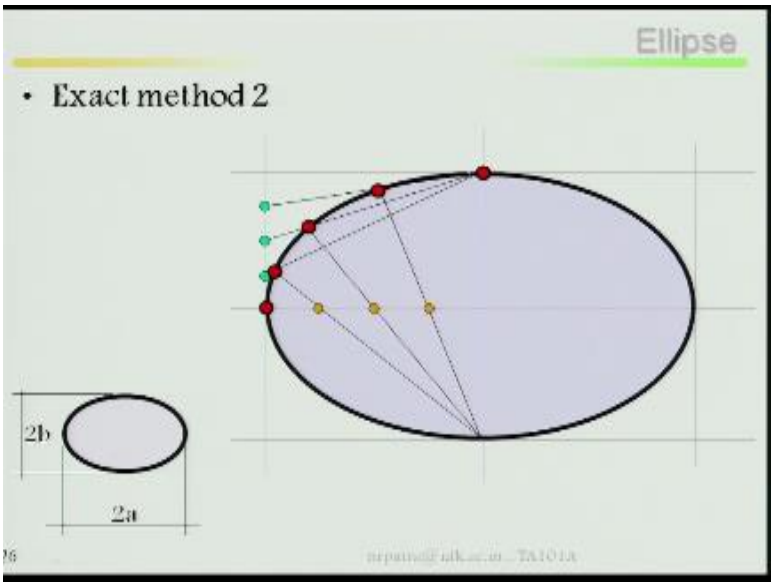

Once again, divide it into four equal parts with a major axis 2a minor axis 2b, then considering one quadrant this quadrant then you take into equal parts of your major axis a, similarly equal number of parts of your minor axis b, then with respective opposite corners draw this, join this and here with respect to opposite corners join it, extended it so it can intersect with each other, then mark these points, then draw a smooth line, smooth curves so it will be form an ellipse, this is your exact method 2.

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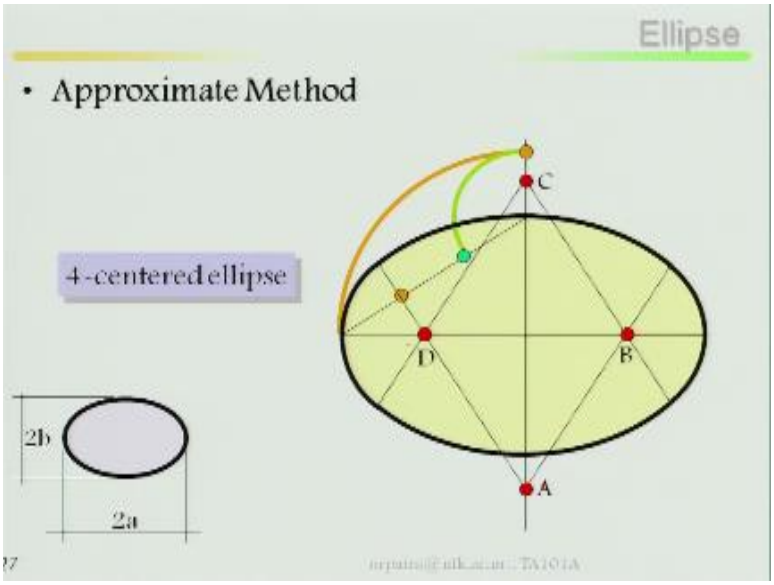

Then there is Approximate method that is called pore centre method. So consider major axis 2a this is a 2a that is a minor this is 2b, then join this major axis from here to here you join it, then considering these size radius draw an arc and mark the point extended part of your minor axis, this is your minor axis that means this is your b, this is your this part is your 2a and this is your b, considering this

And this as radius draw an arc and this will be your mark your point, then next considering this centre and this as radius draw another arc where it got it this point you mark it, say this is point one. Then bisect between these distances has to bisect, mark the point here this is your point, then if this bisect draw the line where it intersect is your minor axis this point you mark it, then considering this point distance from here to here distance look at here, distance from here to here take same distance from here to here, mark it here then, then with this, this point it has to be extended.

Then similarly the procedure what you are followed here and superimpose here other side, mark this point, then mark your point A, B, C, D. So considering this A draw this arc here then considering this B and D considering this radius draw an arc. So this will give you an

approximate method and it gives an ellipse by means of an approximate method, this is called 4-center ellipse.

Pores, why it is called four centre ellipse? Center one, center two, center three, center four, that is why it is called four centered ellipse. It will be highly required as the class progress while going for autographic as well as isometric cases, this part will come ellipse draw an parabola or circle this car plotting will be there.

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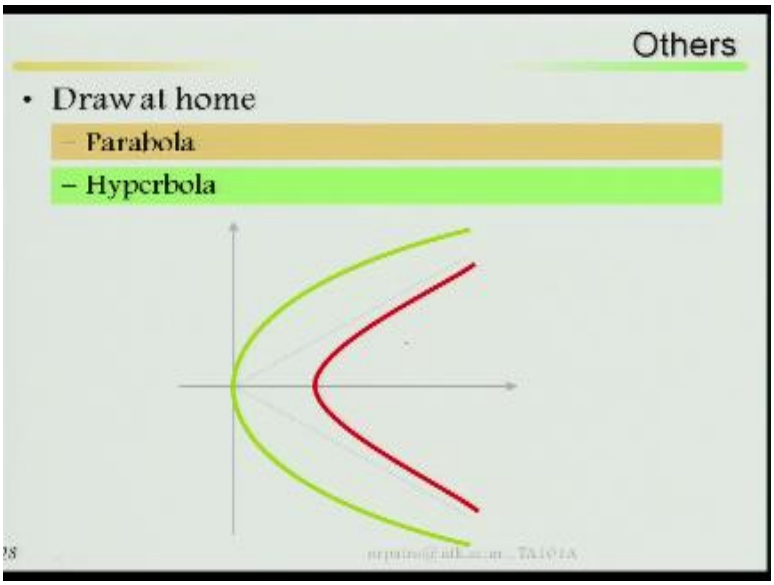

This is one of the assignment at your home you try for parabola as well as high parabola how it has to be prepared, this is all about your curves, then let me go to the basic class of these geometric construction part is over there are many geometric construction you can do it, few examples I have given.

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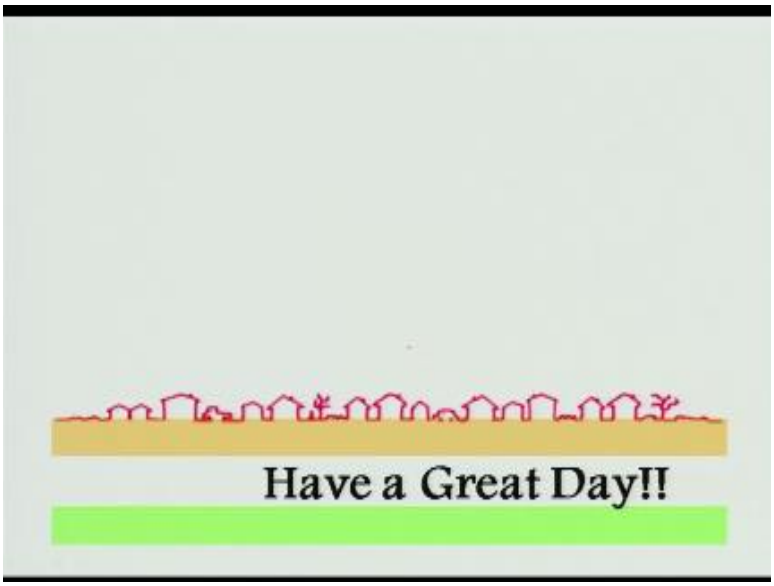

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