Engineering Drawing and Computer Graphics
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Module - 02
Lecture - 08
Conic Sections – II

Hello all, welcome to our NPTEL Online Certification Courses on Engineering Drawing and Computer Graphics.

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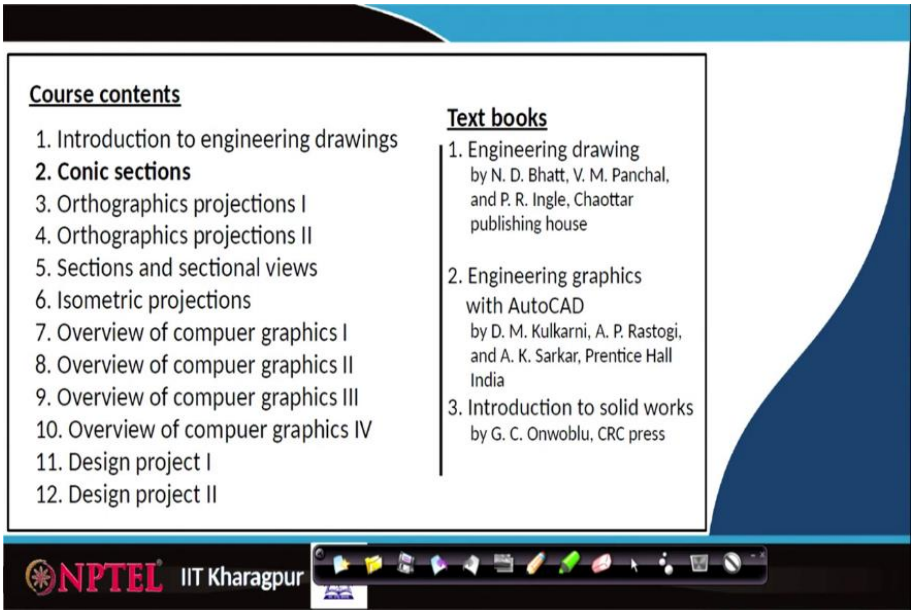

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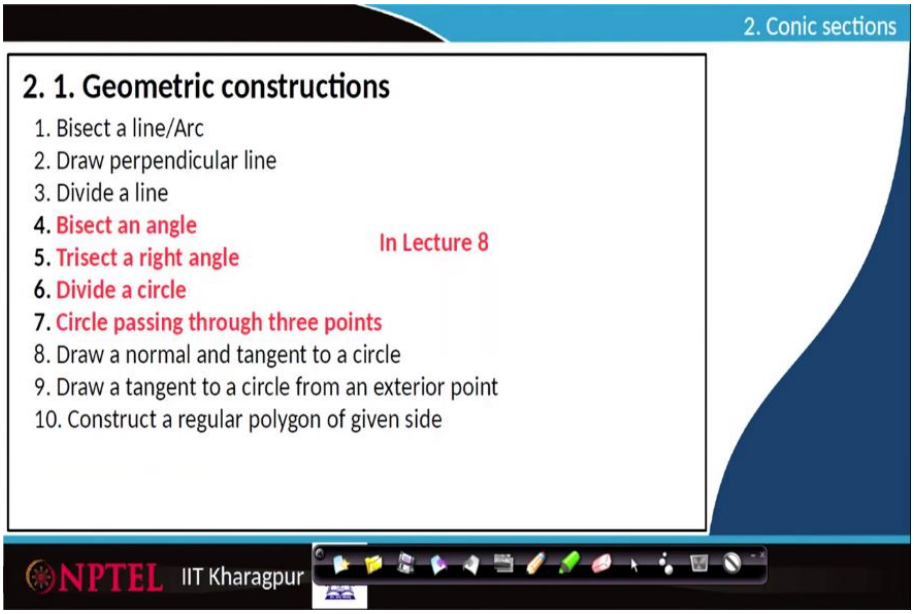

We are in module 2 and lecture 8; the module name is Conic Sections. In lecture 7, we have learned how to bisect a line and an arc; how to draw a perpendicular line; how to divide a line. In lecture 8, we are covering how to bisect an angle, how to trisect a right angle, how to divide a circle, how to pass a circle through three points, these are the things that we are going to learn.

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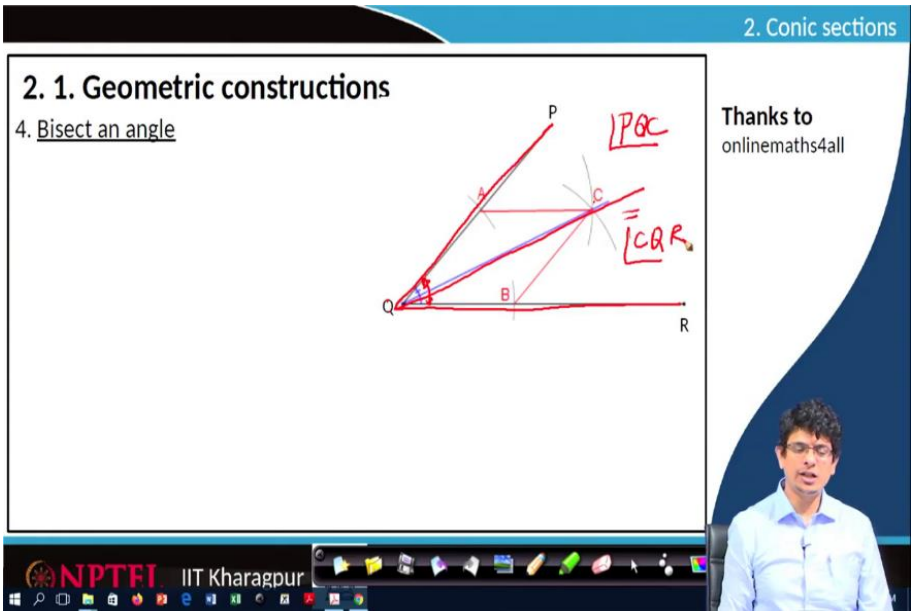

The first one is how to bisect an angle? So, here, we have an angle AQR; some arbitrary angle. Now, we want a line that passes through Q such a way that PQC, angle PQC equal to angle CQR, how to construct that we are going to learn it.

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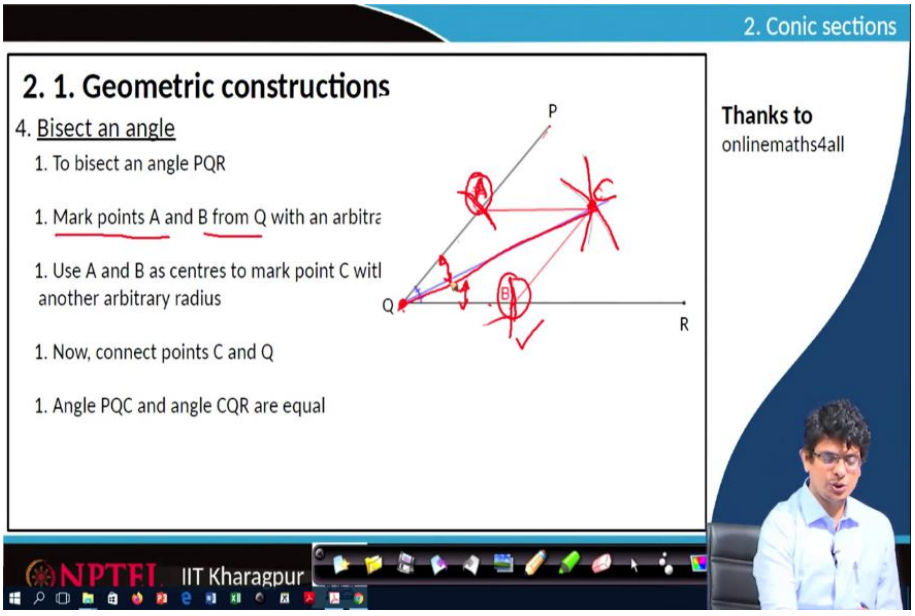

To bisect an angle PQR, first of all, we have to mark points A; mark point A and B from Q with an arbitrary radius. So, we have to use Q mark a random radius. So, because we know from P to Q maybe half of the distance or lower than that, more than that, it does not matter. But first of all, make an arc that will intersect Q to P at A and Q to R at B.

Then, use points A and B as centers with the same radius or arbitrary radius. Mark a curve from A as the centre, similarly from B as centre; mark another arc, where it is intersecting call that point as C. One C is known; from C to Q, join it by a line. Once it is done, this angle and this angle becomes the same. Let us look at geometric construction on the sheet.

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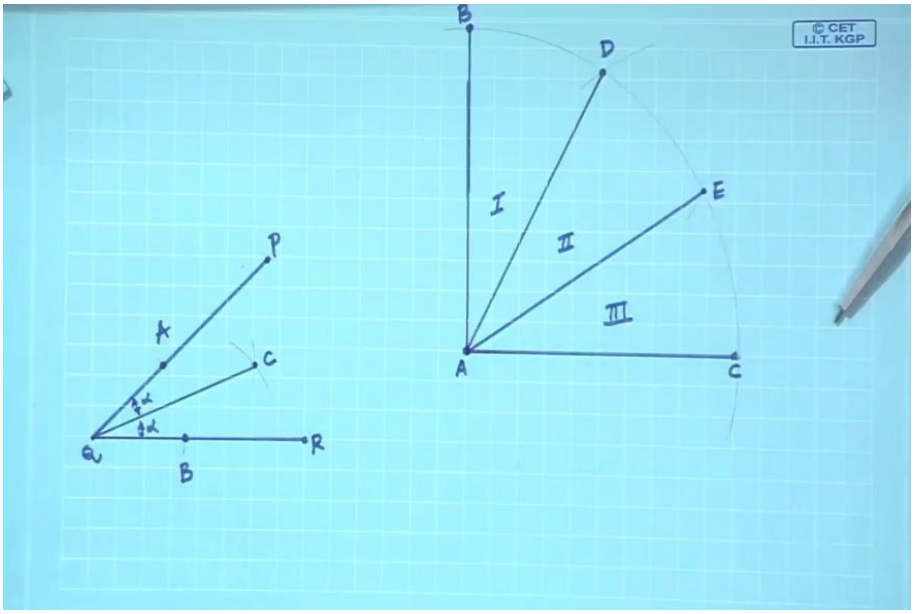

Let us draw an angle, somewhere mark it. So, call points Q, P, R. Now, with Q as a centre at some distance with radius mark curves; say these points as A and B. With the same radius pick B, mark an arc, where it is intersecting, call that point as C. Now, join points

C and Q. If we use this protractor, the ∠PQC will be the same as the ∠CQR. Let us call these as the alpha angle. This is the way we bisect an angle.

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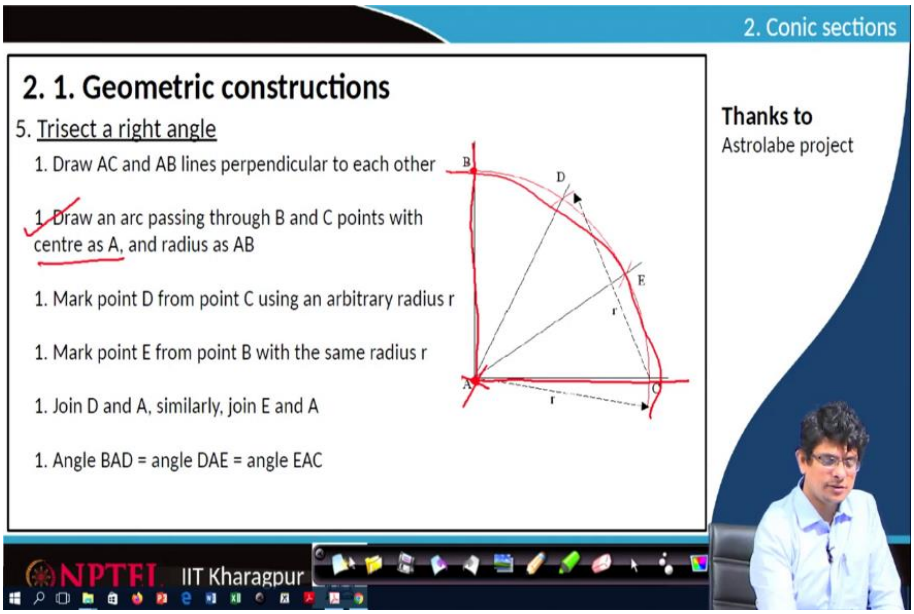

Let us look at the next one. How to trisect a right angle? For example, we have a right angle lines AB and AC. This entire thing, we can use protractor directly to divide it. However, any arbitrary thing, if we would like to construct a similar procedure works.

To trisect it, first of all, we have to pass an arc passing through B and C points with centre as A and radius as AB because we know BAC is the triangle. What is it making? Angle. Use A to B as radius, A as the centre, draw a curve arc, that is this arc..

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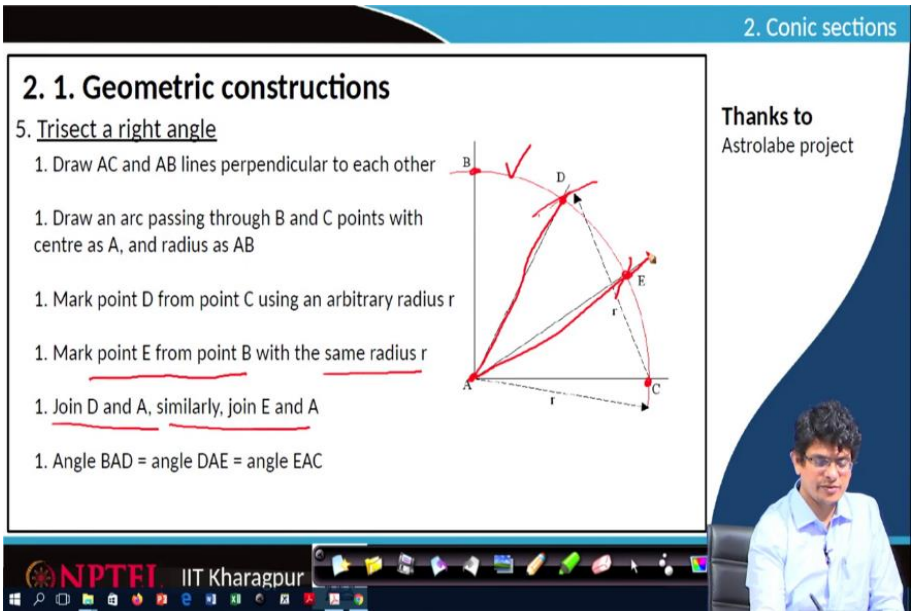

Once it is done, mark point D from point C. So, C is this point, and D is that point. So, use an arbitrary radius, mark a point. Similarly, mark point E from point B; mark a point E with the same radius. Now, join D and A.; similarly, join E and A, after marking.

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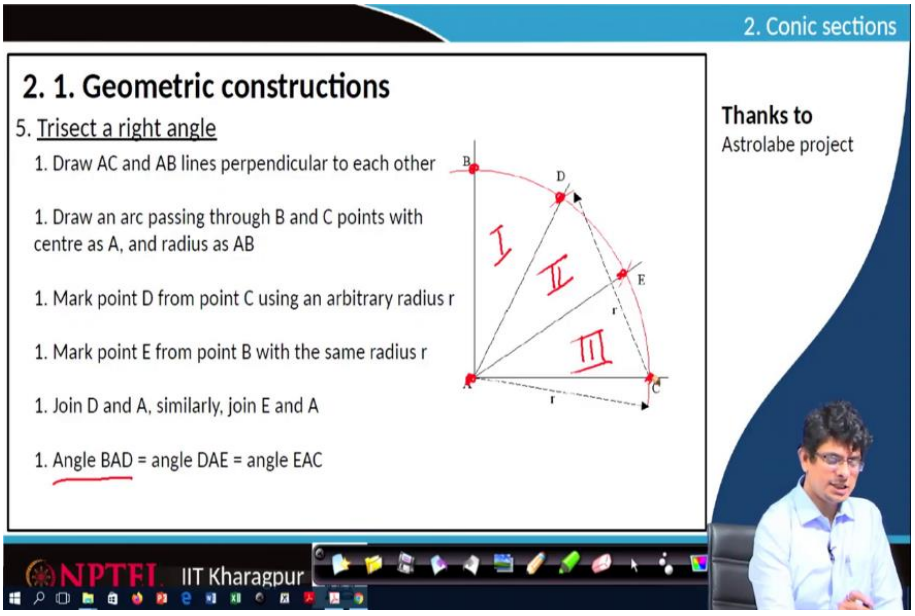

Once it is done, we have three portions; I, II, and III parts. So, angle BAD, angle DAE, angle EAC are all equal. Let us construct that using our geometrical construction. First of all, we have to draw a perpendicular line, right angle. Use a pencil. Let us mark point A, point C. We would like to have a perpendicular line. So, I am trying to use a set square somewhere here; this is the line that we have.

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Now, we have to do the first step a radius A to B passes through that arc; either A to B or A to C. So, let us tighten that, draw an arc. Once it is done, extend through scale so that we have point B also here and an arc passing through B and C. From C, with the same radius, mark an arc; similarly, from B mark an arc, join. The points are D;, the point is E, and once it is done, join them. So, this is the first part, the second part, and this is the third part; this is the way we trisect an angle.

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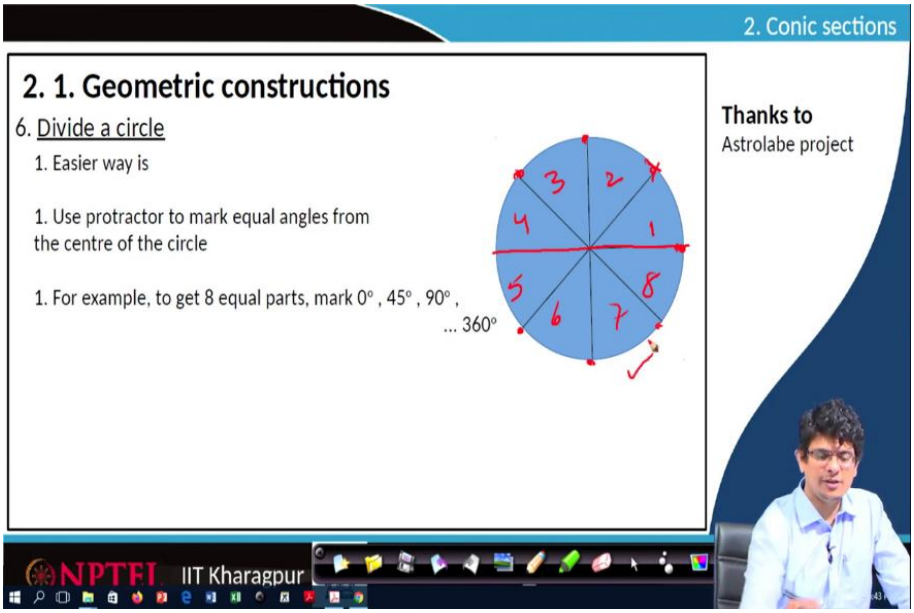

If it is something like a circle, the easiest way is if we would like to divide a circle, first draw a circle. Use your protractor, mark equal angles. So, draw a line, first construct something like a line, use your protractor, mark particular points easiest way, divide that.

If it is something like we would like to divide this full 360 degrees into 8 equal parts; first, second, third, fourth, fifth, sixth, seventh, and eighth. The easiest way is 0, 45, 90, and so on plus addition to 360 if we mark it. Those points we can join it, straight away divide that circle.

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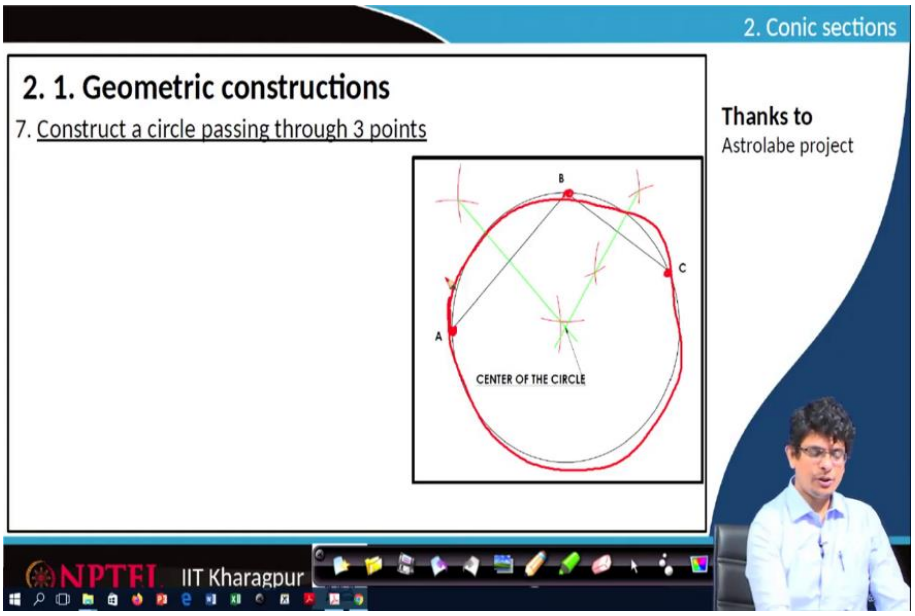

Now, let us look at how to construct a circle passing through 3 points. For example, we have point A, we have point B, we have point C, but we don't know how to construct a circle passing through A, B, C; that is what we are going to learn.

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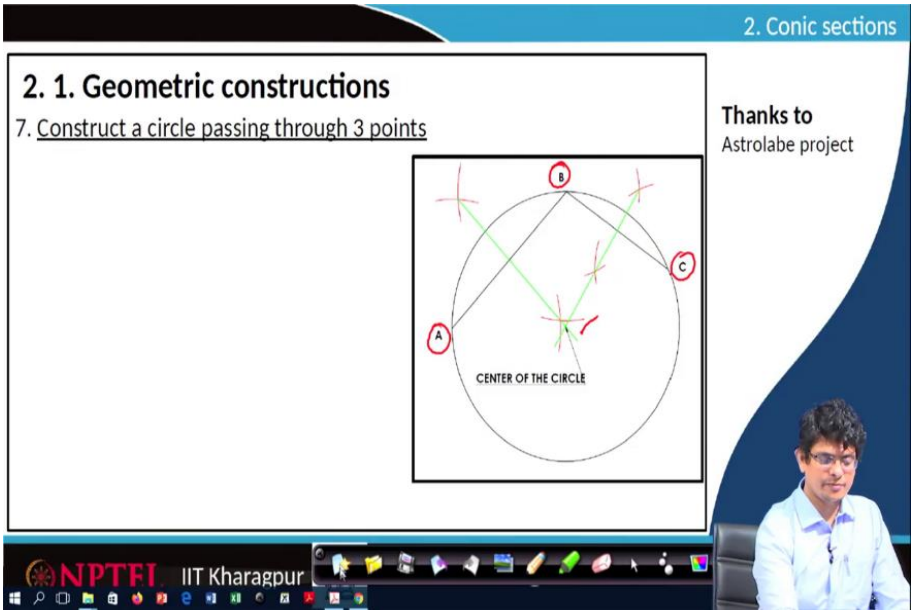

Now, we know only 3 points A, B, and C; no more details are known. We do not know even where the centre is, what the radius is, and so on.

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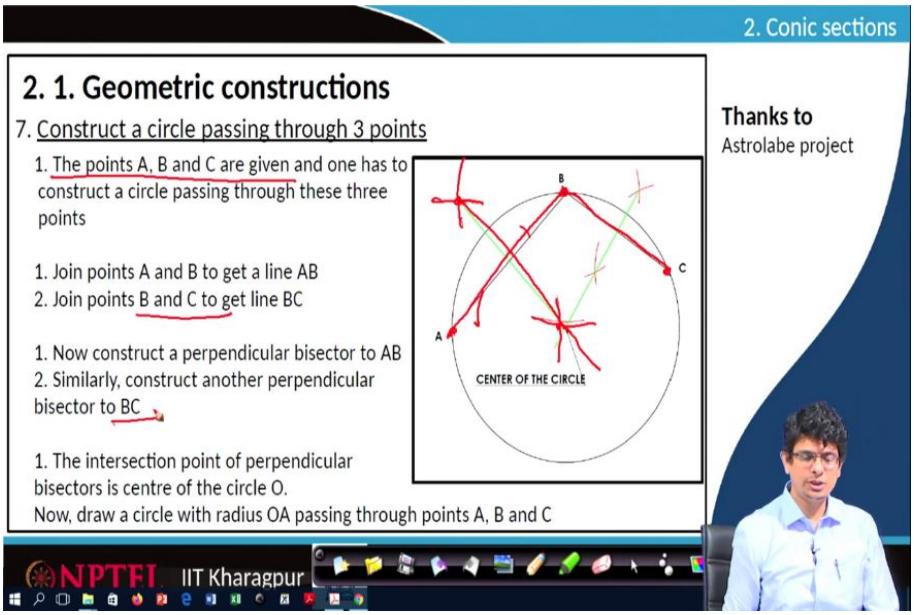

Let us look at the constructional procedure. Points A, B, C are given. To construct the line first step is join point A and B, to get AB line. This is the line what we know. Let us look at the constructional procedure. Points A, B, C are given. To construct the line first step is to join points A and B to get the AB line. This is the line that we know. Similarly, join points B and C to get line BC; point B and point C, join them. These two lines we got to know.

Now, pick the first line AB. How we have constructed bisecting AB, use a radius greater than AB, mark an arc from centre A, with the same radius from B, mark another one. Similarly, from A centre mark an arc, similarly B with the same radius mark another arc. So, once we know this point and this point, join them. Perpendicular bisector, we know, draw it as an extension line. Similarly, construct perpendicular bisector to BC.

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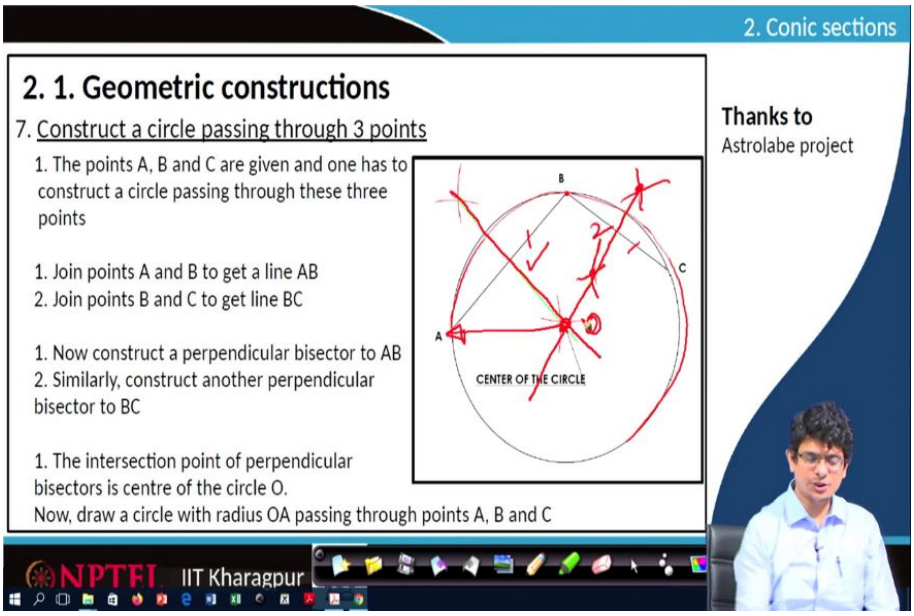

So, this line we have already constructed, to construct BC same procedure. From B greater than the distance mark an arc, from C as the radius mark an arc; with the same radius mark from C, mark from B. Wherever these points are in ah joining, construct one more line. These two perpendicular bisectors, first one and the second perpendicular bisectors, where they will intersect, will be our centre of the circle. Once centre of the circle is identified, from centre O, measure the distance AO, whatever that distance, use your compass, which passes through A, B, C with center O. This is the way we construct it.

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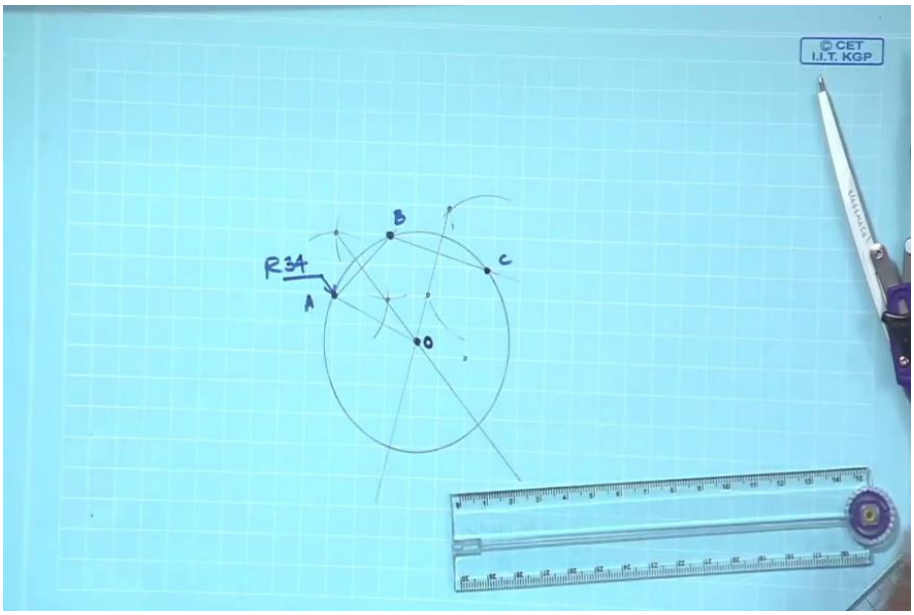

Let us look at that on the sheet. What we know is three points we know; A, perhaps some point B, maybe some point C. These are the points that we know. Let us join these points, let us name them as A, B, and C. Join AB, join BC.

Now, draw a perpendicular bisector from centre A, similarly construct from B, identify points and join these two points. We do not know where exactly centralizing. Similarly, now from BC, centre B, the intersected points, pick that, join them.

So, it looks like this is the point where they are going to intersect. Let us call that point O. Now, join AB, that must be the radius. So, for that, you see, there is a circle that is passing through A, B, and C points with radius O.

If one requires the distance between that AO is the radius of that circle, something like the leader lines we show, R whatever those units. Let us measure it using our scale. This is something like 3.4 centimeters. So, R, we use millimeters as the notation; R 34 for that circle..

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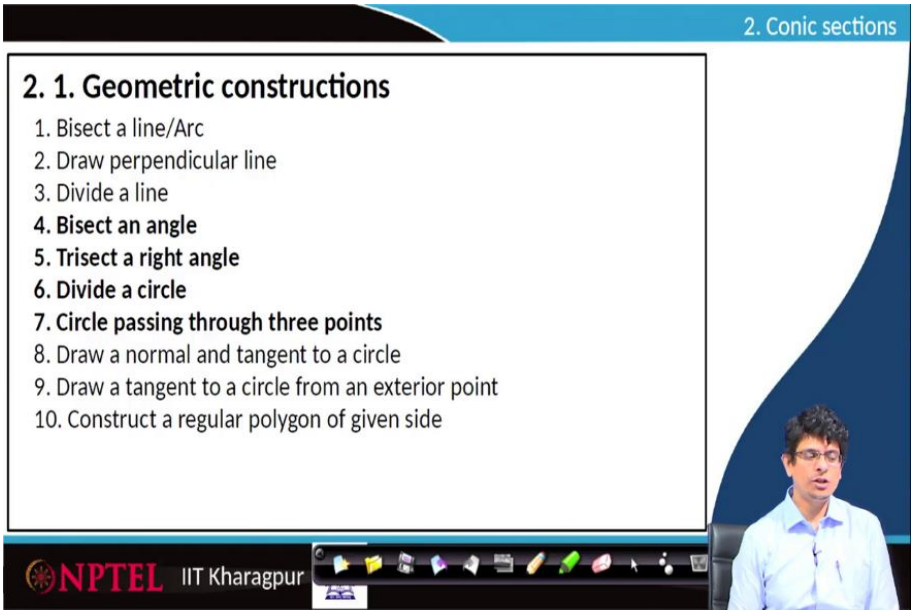

In today's class, we have learned how to bisect an angle, how to trisect an angle, how to divide a circle, and a circle passing through three points. In the next class, we will learn more about drawing a normal and a tangent to a circle. Similarly, how to draw a tangent to a circle from an exterior point and a regular polygon has to be constructed for a given side, how to do that. These are the things we will learn in lecture 9.

Thank you.