the finished blank diameter which you ultimately start cutting of the toothed spaces these are toothed spaces these will be cut off.

So the blank diameter is required, so that the machine operator can check and ultimately start on that directly, so blank diameter that way is very relevant pitch diameter which is formed by mz so here we can put in mz let us see what it gives m x z + mm therefore it comes out to be m x z + 2 that's it, now comes the question of the root diameter what is the root diameter like, the root diameter is equal to the pitch diameter let us come to the figure once again okay.

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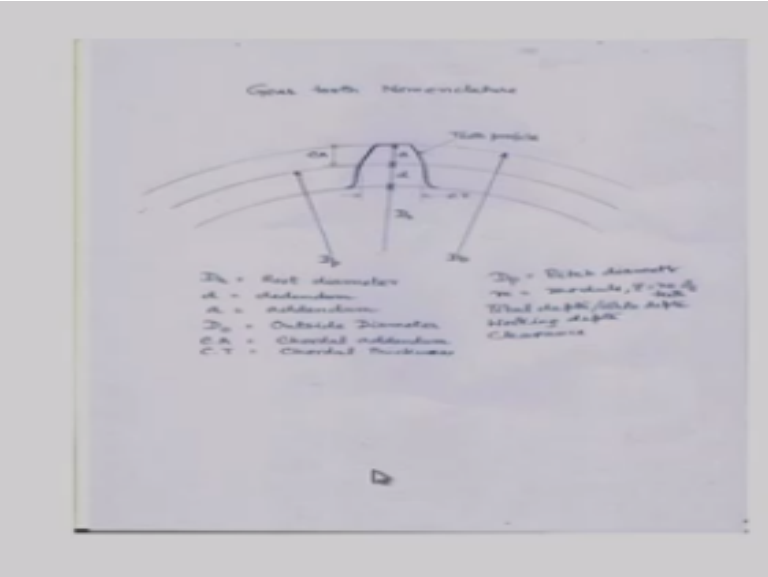

The figure you will find the root diameter is related to the pitch diameter by subtracting dedendum on both sides dedendum here and dedendum there on the other side of the gear so let us dry write down minus twice dedendum.

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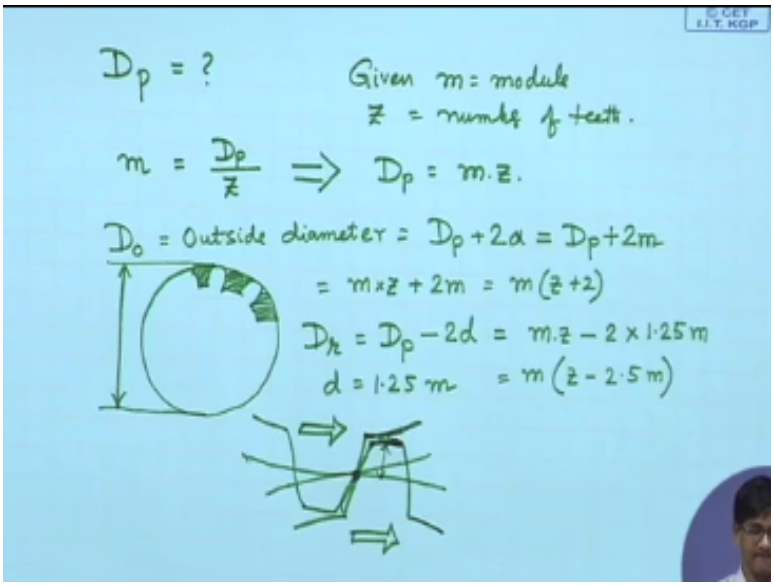

Now what is dedendum, maybe is equal to module, no dedendum is equal to 1.25 module so let us write it down you might ask why is this so because or nearly it should have been dedendum b equal to model following the definition of dedendum it is not so because we want some clearance to exist between gear teeth when they are in mesh what do we mean by this, but before that let us write it down m x z - just a moment into1.25 module all right.

So module can be taken common z - 2.5 modules, now why is this so. So for that let us see a figure this is one gear and this is another gear tooth coming in contact with it and maybe it is getting driven so this is rotating this way this is rotating this way so these two gears have a contact here and say somewhere this is the pitch diameter this is the pitch diameter of this one etc problem is from the pitch diameter this one gear has a you know depth equal to dedendum.

And this one gear from the pitch diameter it has a depth of addendum if addendum and dedendum had been the same if addendum and dedendum had been the same in that case there would have been contact in some cases between this surface that means the outer outside diameter cylindrical curved surface and the root diameter cylindrical curved surface these two would have got contacted.

This would have would not have given the speed ratio that is existing between these two gears the speed ratio which is existing between these two gears is defined by the contact between these two in volumes these are not in volumes okay this speed ratio is simply defined by this by the

diameter ratio and these two diameters are definitely not going to get the same ratio as the pitch diameter ratios.

So the ratio of speed defined by the two pitch diameters is not going to be realized by contact between these two and these shoots these two should never get in touch with each other so provide a clearance in between which is 0.25 module that is why dedendum is larger than the addendum the tip of these gears gear teeth can never contact the roots of the other gear okay, so we now understand why didn't them is more than addendum. And what is the expression of root diameter what's the expression of the outside diameter etc.

Now let us look at some other and what is addendum and what is dedendum you might say why is addendum proportional to the module let us have a look at the gears, now if this be a gear how is module affecting its shape or size let us take a fresh piece of paper.

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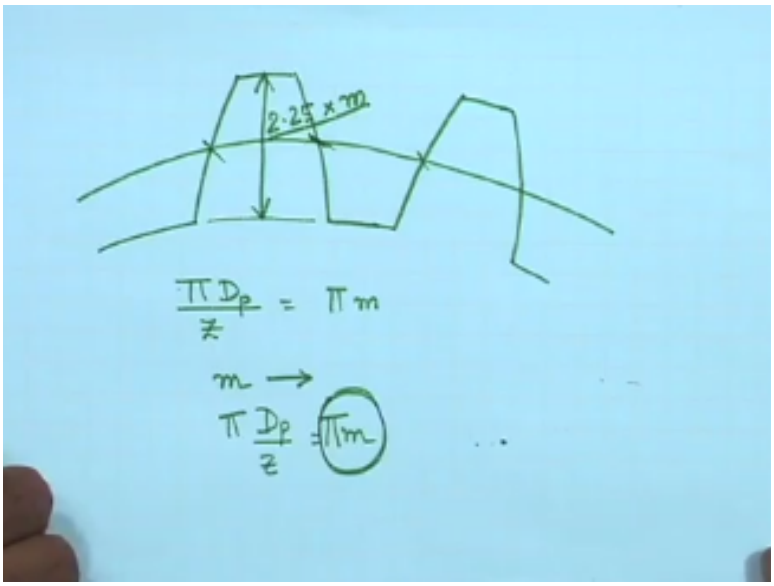

If this be how is module affecting its shape or size we find that if we draw the pitch circumference from here to here okay this distance is constant for all gears having same module so module defines this distance on all gears having the same module so this distance is equal to $\Pi D_P/z$ okay so module is relevant to the gear teeth by this dimension and if we assume that these two dimensions I mean this is equal to this then this one is also perfectly defined by module.

Once you give me the module and the number of teeth I can perfectly define this I can exactly define how much this should be if that be so that means the width of the gears they are they are defined by the module and the number of teeth sorry yeah by the modular number of Teeth so if not just a moment we should say that whatever be the this is equal to Π into module and therefore we can say I should correct this particular statement.

If module is given okay if module is given we can say that this distance will get defined if model not the number of teeth not a number of teeth will simply you know one adding these distances to the circumference so if module is given this thing gets defined so if the width is defined by the module this should be proportionate to it and from the idea of an agenda being slightly more than addendum makes this1.25 and that is why this thing becomes 2.25 into module proportionate to the module simply okay.

And why is this distance only dependent upon the module because since you know DP/ Z is equal to module this distance is nothing but multiplied by Π so it is fully defined by the module this distance is fully defined by the modular I made a mistake it is not dependent we need not say it is dependent number the number of teeth no it is fully defined by the module and we simply make now that the girth is I mean the width is defined by module we make the height also proportionate to it.

This one has to be slightly more and therefore from that it comes to be 2.25 module you might say that why is it exactly equal to module not why not say 0.75 module or 1.2 module those gears are also available like you can have this to be point eight module which are called stub teeth etc but the most widely used one is the simplest one equal to addendum equal to module okay.

So once we have understood this let us move on to the other definitions which are present here for example you will find that in this figure.

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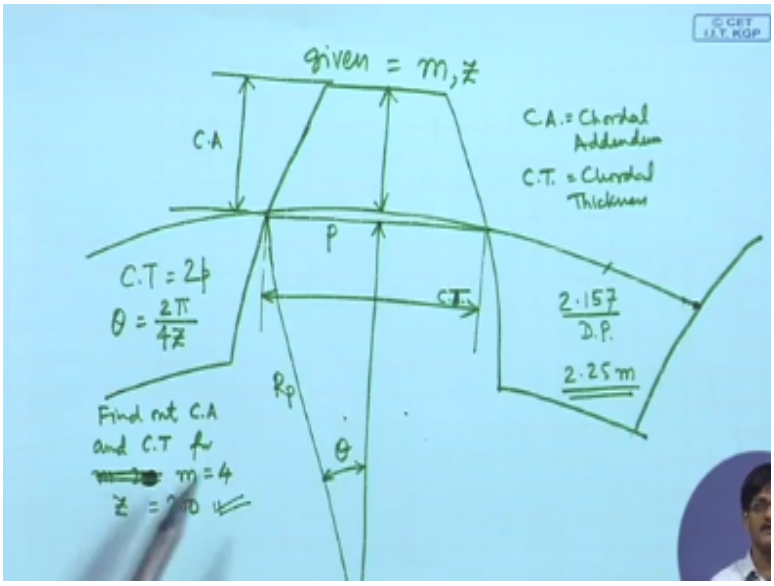

If we make a larger depiction of this one if this be one gear tooth you will find that on the pitch diameter we have depicted two dimensions this one being called as coral sorry say CA and this one being you know is join this by a straight line and pull this up this up this is equal to a sorry coral addendum is this one coral addendum and this is coral thickness coral thickness and coral addendum.

So these are very much relevant in different applications like measurement of the accuracy of gears if you geometrically want to test whether the year that you have cut is correct or not in the use of you know gear vernier toothed caliper this is very much relevant can these be measured suppose I know the number of teeth in the module, by the way I think I should mention here that apart from module you also have DP and in case of DP the dimensions are slightly different in that case the working the total depth is equal to 2.157 /Dp.

Just because you know DP is the reciprocal of module of course the units have to be kept in mind so it comes at the denominator okay just like so we have 2.25 module as the total depth in case of module years in case of DP we have 2.157 /Dp and the working depth is equal to two module and here the working that will be equal to two by DP that way so let us come back to our discussion of Cordell thickness,

Cordell thickness can be found out this way if we can you know draw a right angle triangle right up to the center this is the sorry this is the center which you cannot see but if I see that I know this angle θ I know this pitch radius RP can I find out say if this we then let us give it a name P

Cordell thickness we can write is equal to twice P let us quickly have a look whether w ecan find out P can I find out θ yes.

θ is equal to θ = 2 Π that means 360 degrees divided first of all by Z number of teeth this will give you 4 times Π okay right up to the second time that this is rising this full angle is θ + θ you know middle point θ + θ this way so if we join this to the center this will be 4 θ so therefore we will be having 4 here to give θ twice Π/ 4 Z = θ so I am going to supply you the number of teeth that is known to you.

So that say θ can be calculated can are be calculated yes basically in all problems we will be providing you given we will write given M, Z and we can be found out because M x Z = DP 1/2 of that is Rp therefore 2P can be P can be found out this way why because once you know θ once you know RP you can find out RP Cos θ R P Cos θ is equal to this value P and twice of p0 is equal to quadrant thickness.

Can you find out Cordell addendum yes this distance is equal to addendum and this small distance is equal to RP - RP Cos θ okay so tomorrow I mean next day when we are taking up the subsequent lectures we will solve the problem of solves the problem of find out so the let me write down the problem here find out Cordell addendum and Cordell thickness for m = 20 or let us take a large value m = 200.

Sorry I was thinking of number of teeth M = 2, m is equal to let me write it down perfectly or M = 4, M = 4 and Z =200 find out Cordell addendum and Cordell thickness for m = 4 and z = 200 why are we doing this because as I said this will be useful in the measurement of gear geometry accuracy of gear geometry after a gear has been manufactured so this we will be solving in our assignments vertically solution may be in the fifth lecture.

So you can have some practice get it done yourself and then we will compare notes last of all let me just add you might think of some problems like if I if I give you two years one is having module 3 and another is having module 10 does it mean larger module will have larger gear larger teeth or smaller module will have larger teeth so with this we come to the end of the third lecture thank you very much.