Financial Mathematics
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Lecture – 28
Introduction to Cost of Credit and Amortization

Welcome to the lecture on introduction to cost of credit and amortization, so in this lecture we are going to discuss about the cost of credit the concept which is used by the credit card companies then we are also going to discuss about the credit limit and debit limit which is important. You must know that what is the credit limit and debit limit how they are important what are the factors which govern these get in debit limits.

Then we will also have the introduction to the amortization concept and finally in the coming lectures we will also discuss about the amortizing schedule that is something related to the you know loans which we take for a longer period of time. So, in those cases these are more technical that so there is amortization concept or amortization schedule is important and we need to know what is this schedule? How you have to pay how much interest you are paying how much principle is getting subtracted in course of time.

All that is you know coming under this category of study that is you know amortization. So, coming to the introduction to the cost of credit what is cost of credit basically?

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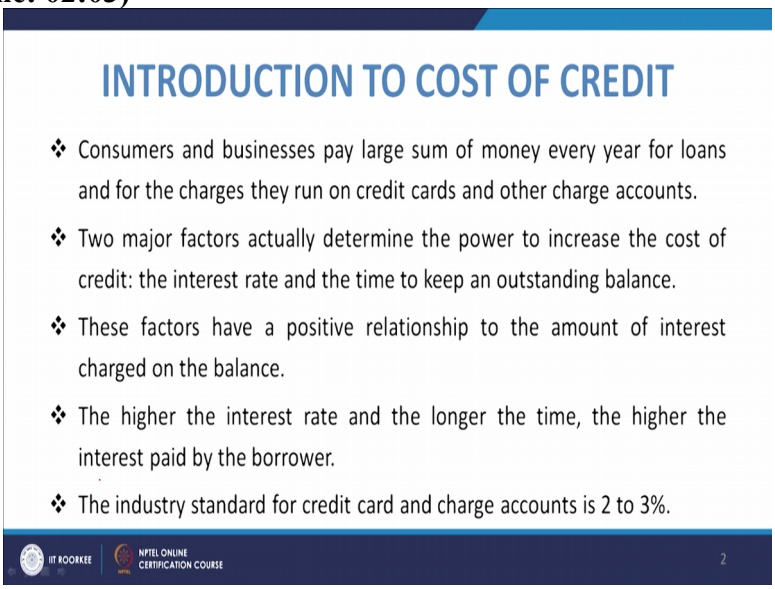

So, what we do you do nowadays these consumers and business businesses they have to pay large sum of money every year for loans and for the charges they run on credit cards another charge account so you have we must be very much conversant with the concept of credit cards and charge accounts and we basically take large amount of loan we are basically using

them for you know so on that credit basically and you know we are having that credit so that we can purchase something on loan.

And then later on we are we have to put you repay that so that is a usual practice by consumers and business businesses nowadays and in that basically there are two major factors which are determining the power to increase the cost of credit. So, when you are using these credit card sorts the charge accounts then in that case there are 2 things which are important that is interest rate and the time to keep an outstanding balance.

So, at what interest rate whatever is the interest rate charged by them and how much time you are keeping that outstanding balance so when you are paying you know the amount or partial payment when you are making so what is outstanding balances in between. So, average daily balance is there that is also coming into picture in those cases and then that basically determines the; you know the power to increase the cost of credit.

So, basically the cost of a who goes on increasing by these factors. So, these factors have a positive relationship to the amount of interest charged on the balance so the thing is that if the interest rate is higher if they the interest rate charged by that credit card company or the charged account is higher in that case certainly you are paying the larger quantity of interest and to say at the same time if you have the longer time you know like if you are keeping the outstanding balance for a large.

In that case also you know the interest paid by the borrower is larger. So, the industry standard for record card and charge accounts is about 2 to 3%age their normal you know now practice that is so that is an industrial standard for the credit card and the charge accounts is 2 to 3%. So, the thing is that what we need to understand in this case is that what is important is that you must know that this interest rate as well as the time for which you are keeping that amount that should be you know the minimum in that case the interest charge will be lesser and lesser.

So, you know we can just see one example that how these businesses operate how you pay the charges for that credit so what is the cost of credit in those cases.

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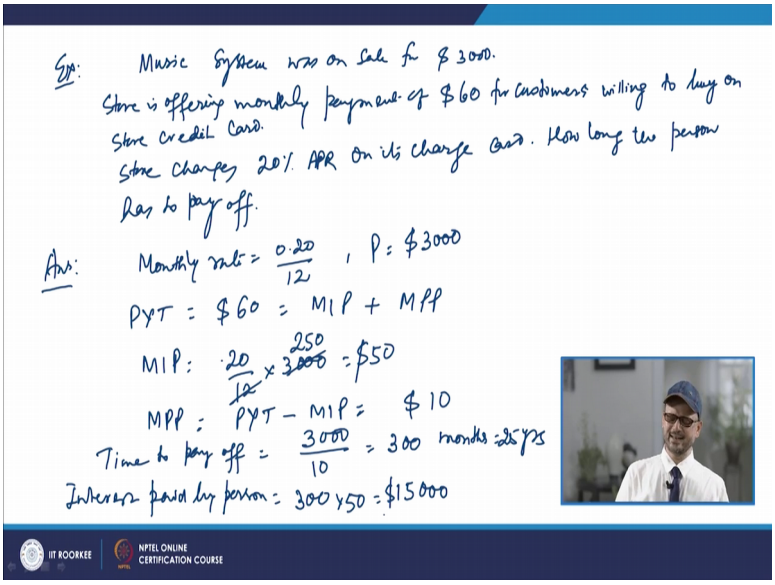

Now suppose for example you know a person has purchased so he went to the shopping mall and he had seen one offer on one music system and the music system was sale for rupees 3000 so music system was sale for dollars basically 3000. Now the thing is that this store is offering you know monthly payment of only dollar 60. So, the store is offering monthly payment of dollar 60 only.

So that you know for those customers who are willing to purchase on credit card for customers willing to buy on store credit card. So, the store is basically issuing a credit card and if you are trying to purchase the system of rupees or dollar 3000 then in that case it is offering you that you only pay dollar 60 you know every month for that. Now you know it looks very you know catchy that you have to only pay dollar 60 every month and you will get a sound system.

Now the story is charging basically stood charges now it is charging basically 20% you know APR annual%age so that is rate of interest you know on its charge card. So, now the thing is that how long the person has to you know pay this you know purchase, so how long you know the person has to pay off you know for this purchase how much you know and what will be the total interest that will be you know deposited by them.

So, that is what you know you know you have to see that how you are going to see that what will be the interest charged and how long it is going to take. Now the thing is what you see that your APR annual percentage rate which is charged by the credit card is 20% and it is charging monthly so the for the monthly you know monthly rate of interest will be you know 0.20/ 12 so that will be your a monthly rate of interest now in that case you know that you have a principle amount is dollar 3000.

So, in that case your if you look at the you know now he is giving the dollar 60 as the monthly payment. So, basically you know monthly term that is coming to be dollar 60 now if you look at the so this basically involves both the things one is the interest portion monthly interest portion and this is basically monthly interest portion and monthly principle portion. Now what is the monthly interest portion now monthly interest portion will be basically the 0.20 / 12 so 12 / 12% of 30000 so it will be 0.2 0/12 that will be 3000.

So, it will be you know 250 and then if you multiply that it will be rupees 50 I mean $50, so 50$ is the monthly interest portion it means monthly principle portion is the monthly you know installment which you are paying minus the interest portion so that is $10 it means in every month it is basically only contribute you are only deducting $10 for its principle amount and principle amount is 3000.

So, no time to pay off so it will be 3000 /10 so it will be 300 a month it means it will be 25 years it will be taking to completely pay off this you know amount of 3000 dollars by the person. If you calculate the amount of interest charged so the interest which is you know charged you know interest paid by the person so he is for 25 years or three hundred months he is charging you know he's paying the interest and every month he is paying the interest of 50.

So, basically now in that case he is 15000 on roughly if you can see for 15000 is paying the interest so for a an amount of 3000 worth of product he is paying $15,000 as interest. So, this is how you see that this is the cost of credit you know how you know how much interest is paying what is the schedule of payment so all these things are you know clear by looking at this you know table.

The thing is that if you actually see in that case if you analyze actually then since he is paying the you know 10 every time 10 rupees so his principle amount is coming down so basically interest will not be the same in fact interest will be different and in that case so the principle amount, so every time he will have the different values actually in actual calculation because the interest all will not be every month that is 60.

So, that way so in the first month it will be charging 60 you know 50 as the interest and 10 will be subtracted so in the next month is his principle amount is maybe 2990 so from there so that way that will be different on that account. So, basically analysis can be done and it has been seen that when you have some minimum payment when you go for some minimum

payment in actual terms it has been seen that if suppose you have 2% of the down payment minimum payment which you are doing in that case you know depending upon the time your interest earned will be different.

So, that way you what you see so now is this is a 2% payment basically not down payment basically it is 2% payment 3000 is there so you are paying 2% in that case now in that case in actual situations when you calculate the interest it is seen that if your payment is 2% every month then for the 20% APR actually you are taking you know for the 3.6 years of time and the whole interest charge is 12,126 rupees in actual case.

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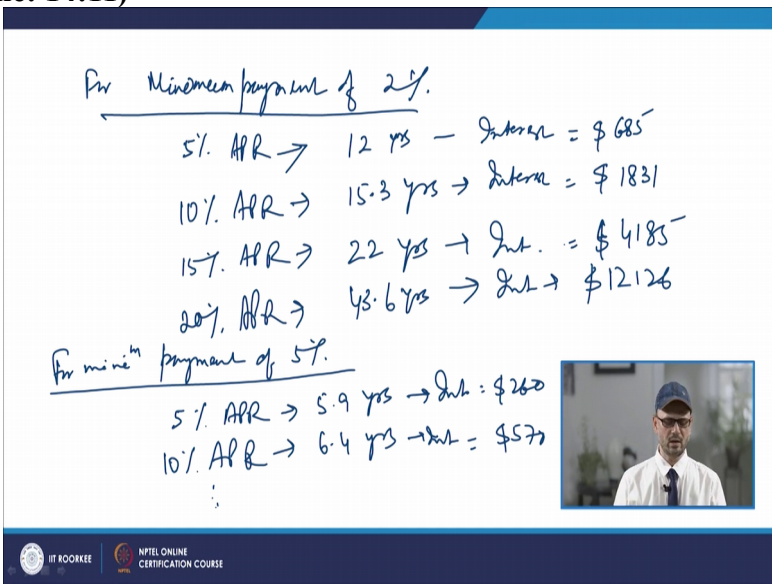

Now in those cases so you can see that for you know minimum payment of 2% now if you have the minimum payment of 2% in that case you know you know for 5% APR if you calculate your you know in 12 years your interest in which you pay is dollar 685 and in you know 8.75 years so now in that case if you have you know 3% of payment now for this is for 2% now if you go for 10% APR in that case is a whole payoff will be in 15.3 years and your interest charged will be you know 1831.

So, this is how you see that when your APR is increasing then you are taking more time for the payoff and since you are taking more time in that case interest charge will be more 1831. Similarly if you go to 15% APR in that case you have you will see that you are going to do have see that it is completed in 22 years of time and interest earned is interest charge which is seen is a dollar 4185 and if you go to 20% APR in that case you take 43.6 years actually case and interest earned is 12126 dollars.

So, this way this minimum payment you know of 2% if you go for minimum payment of 3% suppose let us say you take 5% of minimum payment in that case it is seen that for 5% APR

what happened that you will take lesser time you will finish the you know loan and it will take only 5.9 years and interest which will be paid it will be only dollar 260. So, similarly for 10% APR if you go for you know the minimum of 5% that is you are paying 300 dollars every month.

In that case it will take 6.4 years and interest charge will be there are 570 so that way you can see that how these you know interest rate APR annual percentage rate of interest and also the time you know for which these are standing balance is maintained you are paying that will affect the amount of interest is which is charged to you and you know you can then judge whether you should go with that offer or not.

And certainly it is obvious that if you are a; Pr is more or the time for which you are keeping the balance you know that will be more in that case you have to pay large amount of interest.

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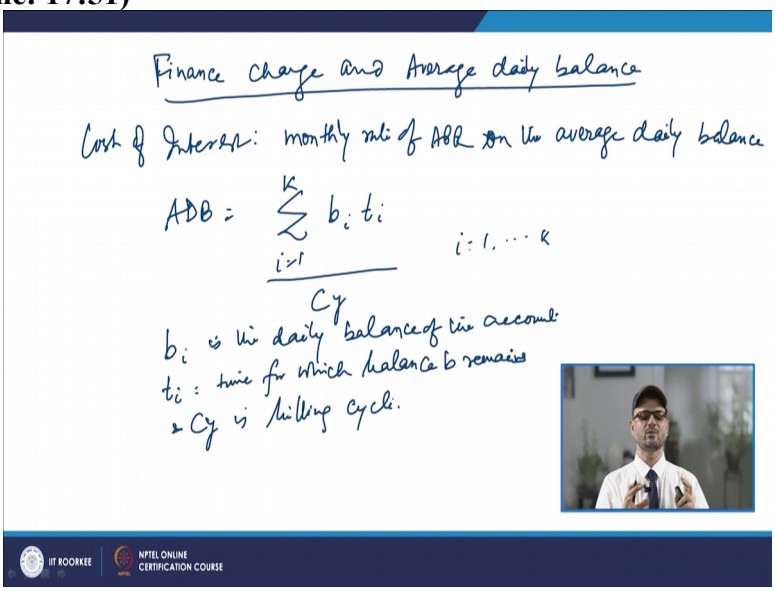

Now based on this you have another concept of the you know finance charge and average daily balance so what you see is that you are paying you know some amount for that and depending upon the average daily balance basically you are you know charging that you are charged by the financial company. So, happens that most of these you know credit card companies so you have the credit statements you will have a monthly you know credit card statement.

And basically that will show a finance charge basically which is nothing but the interest cost so it will be that will be the cost of the interest. Now this cost of interest you have to calculate and this cost of interest basically will be calculated by the monthly rate of APR so, you have to have the product of the monthly rate of APR you know so this have this will be up you

know this cost of interest will be you know calculated by applying this monthly rate of APR and it will be on the average daily balance.

So, basically you will have a statement that how much is the average daily balance in that statement and based on that you will be calculating this cost of interest that is your finance charge. Now on that you will calculate these average daily balance by a formula and this formula is nothing but you have I = 1 to K and that will be b i t i and this is divided by C i, so this i will be from 1 to K.

And in this case this b i is the daily balance of the account and t i is the time for which these balance be demons and C i is the billing cycle which is normally done on the monthly basis. Now the concept is that if suppose in a month the statement will start and in between you have purchased something then you have also paid some amount so that way the balances average daily but the daily balance will be going on changing and you have to calculate that average daily balance.

So, for that what you see is that suppose you start with training with $100 on the first day you have the credit and then on the seventh day you have a further purchased something like $50 product so for 6 days 100 and from 7th day again it will be 150 so and then suppose on 10th day you have paid some amount so for that 7, 8 and 9 you have for 3 days it will be 150 so that way you will have the calculation of these credit you know this balance amount and then average daily balance.

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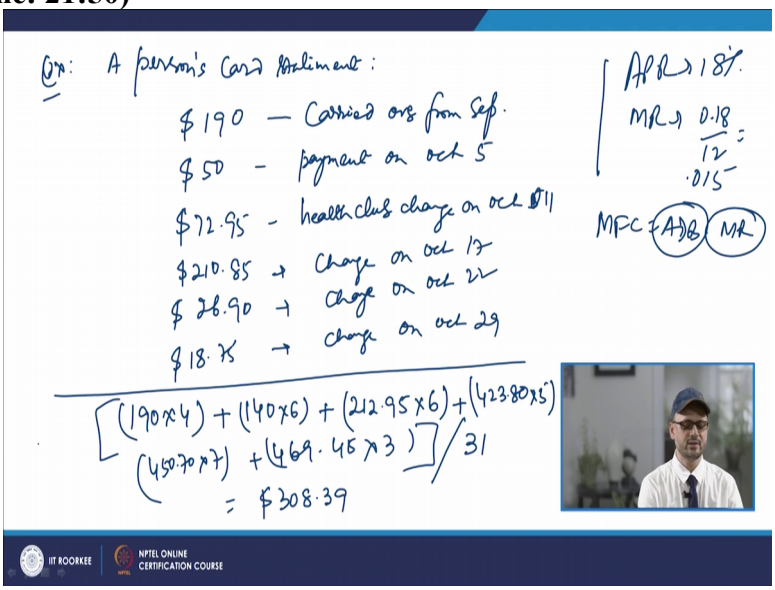

Now that can be you know understood by one of the example suppose that there is a you know a person whose statement was seen and a person's you know example is there that a person's card statement was seen you know you are well you must be very much familiar

with these things because everybody everyone nowadays have credit cards and you must be getting these card statement from the credit card companies.

So a person's card statement reads like this that you supposed has $90 which is carried over from September so from the next month earlier month you have got some so that this is that 190 then you have suppose $50 you know you have done the payment so on October 5 then you have $72.95 this is basically the health club charge on October 5. So, this is October basically 11 further you have you know all these details will be there for the whole month.

Say $210.85 so that is charged on October 17, so then further you have $26.90 that is again charged on October 22 and further in the end $18.75 and this is also charged on October 29. Now if suppose you are told to find these average daily balances and in that case you can find the monthly rate and also the monthly finance charge. So, monthly finance charge will be average daily balance into monthly rate.

So, in that case what we do is now APR basically is said to be suppose 18% in that case if the APR you know that is monthly annually so, monthly it will be 1.5% so once you know the APR and once you find the average daily balance then I mean this monthly rate will be one once you know so the your monthly rate will be 0.18 /12 so it will be .015. So, now it basically monthly finance charge you can find every daily balance into MR.

So, this is how you calculate these monthly finance charges which is charged by the financial companies. So, if you look at these statements of the credit card companies what you see that you know you have the balance of 190 which is there on the first day and 190 is there you know so on October 5 you are taking that again pay me paying you know 550 so till that you had 190 going on so one manatee is going for four days so 190 will be multiplied with 4 so that's what we have seen the you know formula.

For how long this 190 is there this is for 4 days now after four days this balance because he has paid 50 so now he is having the you know daily balance of 140. Now from 5 onwards he has the balance of 140 so for 140 5, 6, 7, 8, 9 and 10 so this will be six days so then again he has a charge of 72 so 140 + 72.95 will be 212.95 and this you know will continue so this will continue till 16th so there are a further six days.

Then so further you will be adding to that 210 + 8/5 so it will be 423.80 so 423.80 will go for from 17, 18, 19, 20 and 21 5 days so that will go and then you have further 26.90 so it will be 469.45. So, before that you have 423.80 + 26.90 so it will be 450.70 and that will be into 7 +

469.45 *3. So, this you can understand now this is all October statements it will be divided all these summons summed up by 31.

So that will give you $300.839 so this way you get this is your average daily balance this is how the average daily balance is calculated once you know every daily balance you know that MR is 0.015 so your monthly finance charges will be you know average daily balance 300.839 * .015 so it will be $4.63 so this will be your monthly finance charges which will be calculated and you know that this credit card companies they are charging monthly finance charges based on all these average daily balance. So you can calculate the average daily balances from those card statements

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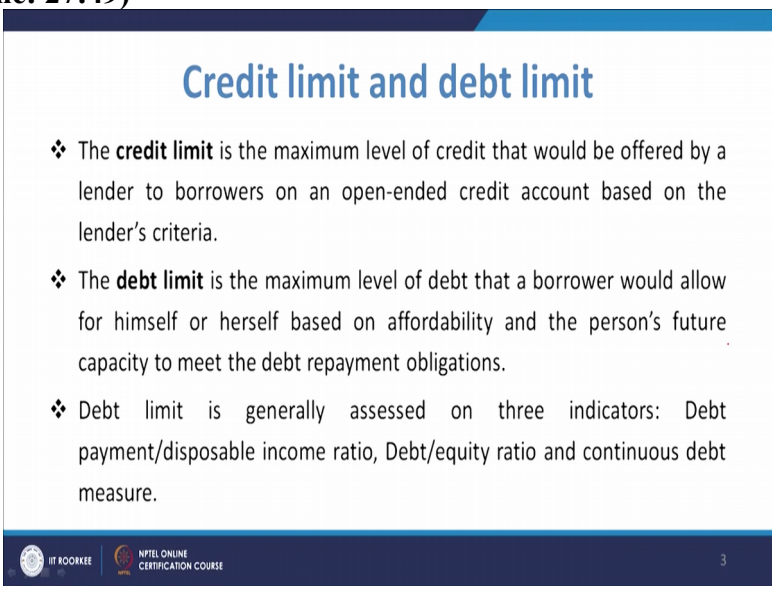

Now we must know something also extra things like we must be knowing the credit limit and the debt limit now the credit limit is the maximum level of credit that would be offered by a lender to borrowers on an open-ended credit account based on the lender criteria. Lender criteria will be there on based on that he will have a criteria he will be set the criteria setting the criteria on that the maximum level of credit which can be offered by the lender to the borrower on an open-ended credit account.

That is your credit limit and similarly debt limit is also the maximum level of debt that a borrower would allow for himself or herself based on affordability and the person's future capacity to meet the debt repayment obligation. So, these are the two things and although critical limit you know on that it has own considerations but debt limit basically is accessed assessed on 3 indicators one is the debt payment by disposable income ratio.

So, it is said that if you go for these finding these debt limits in that case your ratio of these debt payment and the disposable income.

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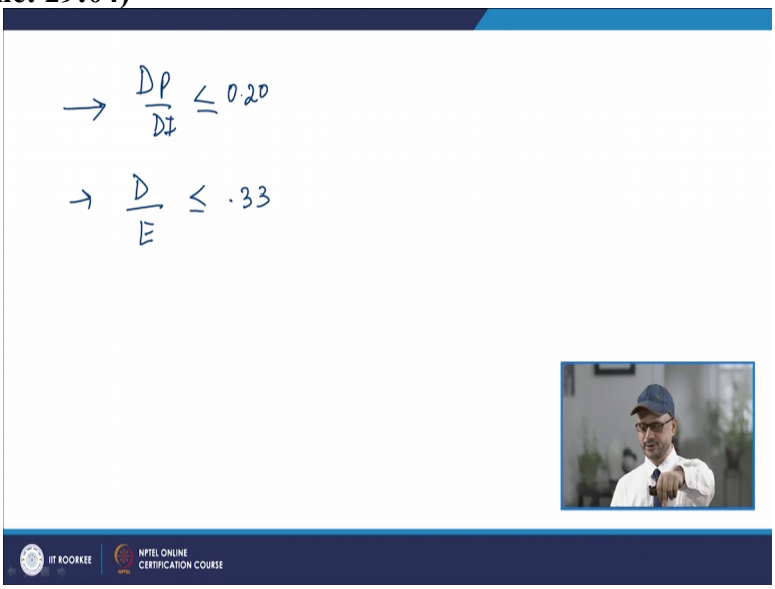

So debt payment DP and disposable income it is said that it should be not more than 20% so it will be less than .20 so it should be less than equal to 20% and if it is more than 20%, 20 to 30% if it comes it means the borrower is over debted. So, that is why you know this is the first condition that the you know no debt payment what he is doing and then this is your disposable income what he is having it should be less than .2.

Similarly you have the second point is the you know debt by equity ratio. So, if you have you know it will talk about once you know state of solvency and here D is measure and it should be you know D / E so D / E would be you know less than debt by equity ratio it might be must be less than equal to 0.33 so that is another thing which sets the debt limit of the material is the person and then also continuous debt you know measure it will tell that how he is you know how he is going to clear his debt.

How he has in the past how you know if he has not been able to clear a debt in 4 to 5 years it means you know that it is he is very much dependent on the debt and then you know he may not get out of it completely so that is how it also tells that how you know you know what should be his debt limit. So, that way the debt limits are calculated.

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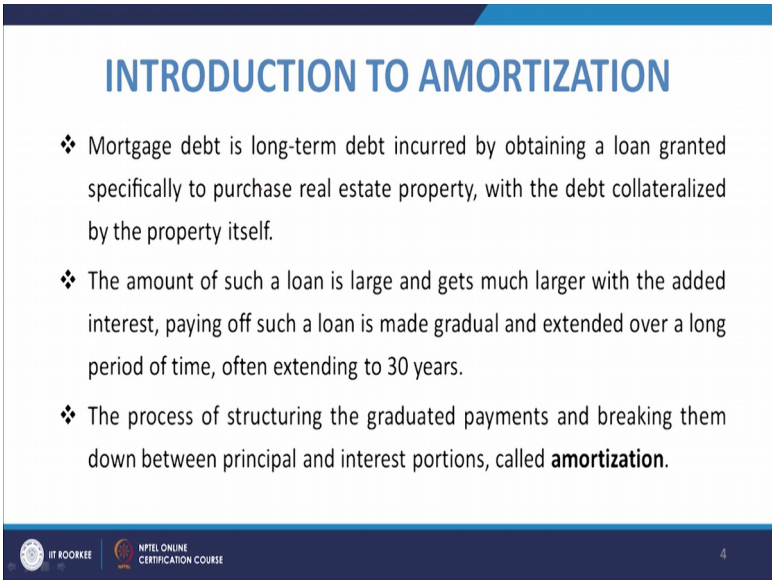

Then another thing which we need to further understand is the concept of amortization. So, basically that is again a debt and this debt is the mortgage debt and it is a long term debt which is incurred by obtaining a loan granted specifically to purchase real estate property. So, now this is very you know common and you know what we see that when we have to purchase these you know large properties in those cases you have to have the loan and with that debt collateralized by the property itself so that this type of debt is known as mortgage debt.

And since it is very large normally about 30 years so you know paying off such a loan is made gradual and extended over a long period of time around 30 years. Now in these cases you have the structuring of the payments what we have understood we have to studied also earlier that we pay these loans in a structured manner by graduated payments and you have the breaking of the breaking down of the principle and interest portions.

So, this process is known as amortization and that is also the one thing which we must know and in the coming lectures we will also discuss that what are the models and Sadducees possible and how we are going to pay off these you know loans or debts especially for the real estate properties or so which we take for larger time you know period so how you are going to you know pay these amounts so that we will study in our coming lectures, thank you very much.