Introduction to Accounting and Finance for Civil Engineers
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Module No. #01
Lecture No. #03
General Discussion on Construction Projects

Namaskar, and welcome to this course once again on, introduction to Accounting and Finance for Civil Engineers, which I am offering with my colleague Professor Jha, IIT Delhi. Now, coming to this lecture, we will continue our discussion on construction projects, and what makes them so special.

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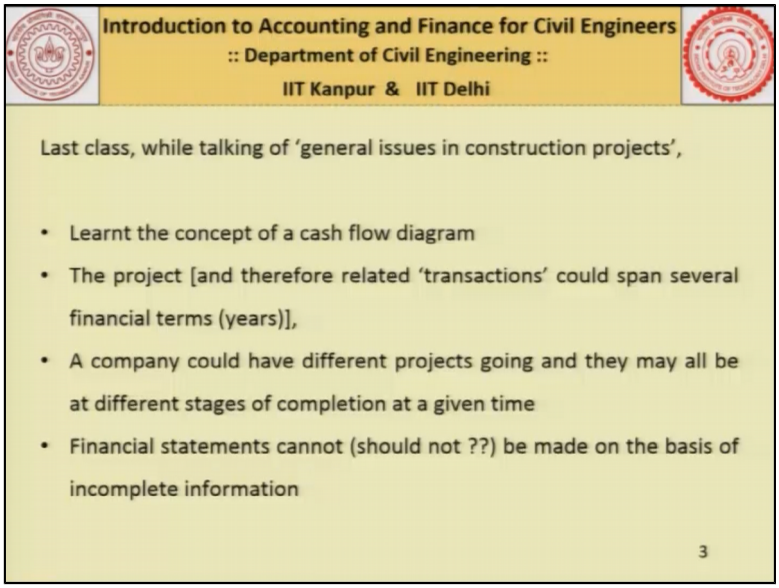

Now, in the last class, when we are talked of general issues in construction projects, we had learned the concept of the cash flow diagram. The inflow and outflow of money, whether it is for the contractor, or the client, and its importance from the point of view of planning, as far as the construction project is concerned. Then, we had learnt, that the project, and therefore the related transactions, could span for several financial year or terms.

And, that makes it interesting to figure out, how the account books for that period will be maintained. Also, we discussed the situation, that the company could have, different projects going on. And, they may all be at different stages of completion, at a given point in time. And, from those various projects, there could be receipts, as far as running bills is concerned, and expenditures being incurred in different projects.

Now, how should that income and expenditure reflect, as far as the financial statements of their company is concerned, for a given financial year. And of course, we must remember, that the financial statements cannot, and possibly should not, be made, on the basis of incomplete information. And, when it comes to project which is ongoing, whatever is coming in, whatever is going out, to that extent, is not a complete information.

Because, those things are all subject to change. And, that is what, the spirit of a running account bill is. That, it is subject to further verifications, changes in swan. Of course, we try to avoid those changes, to the extent possible. But, at the end of it in a financial sense, the matter is not closed. So, that is what we had done in the last class.

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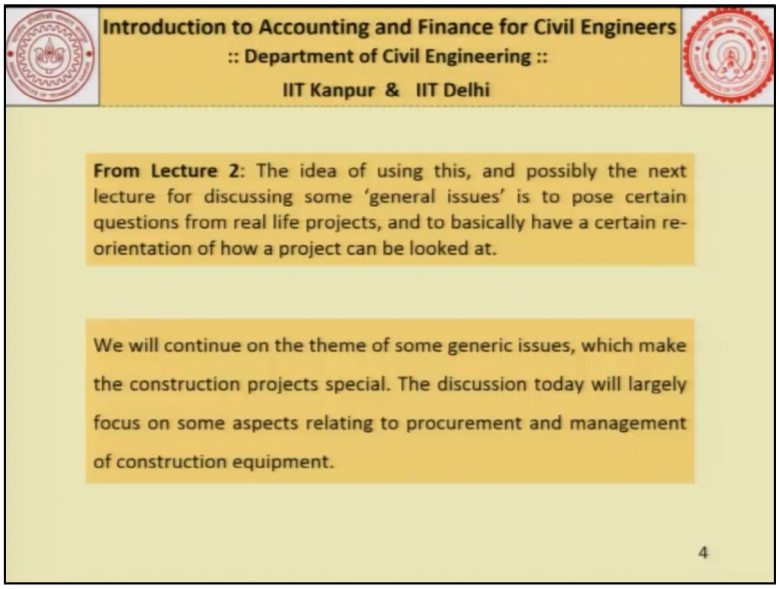

So, coming to our discussion today, I will recall again from the last class, that what we had said was, that the idea of using this, that is the last class, and possibly the next one, which is this one, we will discuss general issues in construction projects. And, we will pose certain questions from real life projects, to basically have a certain reorientation, as far as, you are concerned, and see, how a construction project can be looked at.

So, what we will do today is, we will continue our theme of generic issues, which make the construction projects special. And, the discussion will be largely focused on, some aspects relating to procurement and management of construction equipment. This, let me emphasise, is a very important aspect of modern construction projects, where mechanisation is a very, very important part of the construction works.

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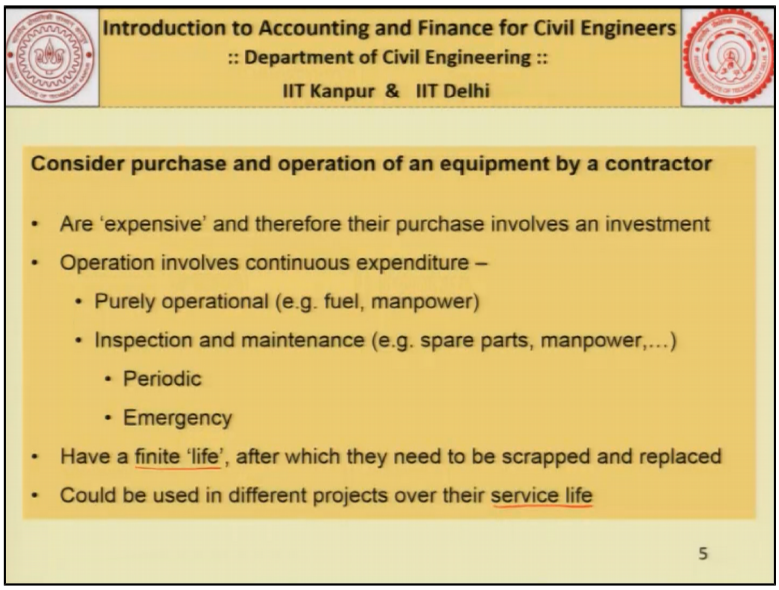

Now, let us consider, the purchase and operation of a construction equipment, by a contracting company. What we must remember, when we talk of construction equipment is, that they are very expensive. It is not a very small purchase. Most of these construction equipment's involve an investment, where we expect certain returns. And therefore, the companies have to be very careful. They have to go through a lot of process, before they go ahead and buy an equipment.

Then, as far as the operation of these construction equipment is concerned, it involves continuous expenditure. That is, it could be purely operational. Whatever equipment you use, it will consume some fuel, it will consume some manpower. And, that expenditure is incurred all the time, so long as the equipment is being used. So, apart from this, purely operational expenses, there are inspection and maintenance expenses, for these equipment, which could be by way of spare parts, manpower involved in the inspection and maintenance of these equipment.

And, this inspection and maintenance, as far as the construction equipment is concerned, could be periodic, it could be emergency. So, one example that I can give you, as far as this part is concerned is that, if you think in terms of the car that you buy, and the car that you operate. You have a car. You bought a car. You invested certain amount of money. And then, if you do not run the car, there is no expense. But, if you run the car, there is a fuel expenditure.

If you have a driver, who runs the car, you have the salary, and so on and so forth. And then, periodically, you have to make sure, that the car is in running condition. That is, there are certain parts in the car, which need periodic replacement, they need periodic inspection. Then, there may be at times, emergency inspections and emergency repairs, that have to be carried out. That is how, we look at the different expenses, associated with construction equipment as well.

There are purely operational expenses, there are inspection and maintenance expenses, periodic emergency, and so on. Apart from this, we must remember that, construction equipment has a finite life. And, after that, they need to be scrapped and replaced. Now, when it comes to scrapping and replacing these equipment, we must remember that, we need to address the question, is there any salvage value? Does this scrap have any value?

And then, how do we replace the equipment? When do we replace the equipment? How do we get the resources to replace the equipment? These are the kind of questions, that we need to address as well. Further, we have to remember that, an equipment may be used in different projects, over its service life. So, in the previous discussion here, when we are talking of a finite life, we remember that, the equipment over its service life, and this service life, is this finite life, that we are talking about.

So, during the service life of the equipment, the equipment could be used in different projects. The question, that we have to answer is that, if the equipment, let us say, costs 10 Crores, how do we apportion the 10 Crores, in the different projects, that it works in. So, these are some of the questions, that we need to answer, and discuss in a generic sense. And then, of course we will get into more specific details, in subsequent lectures.

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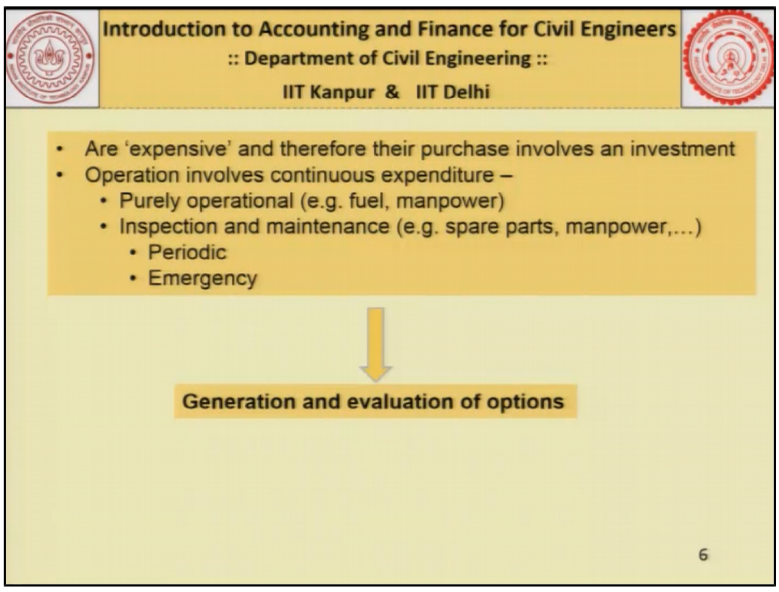

So, coming to the first part, that is, the investment involved in the procurement of these equipment, and the operational expenses, whether they are purely operational, or it is inspection and maintenance, what it boils down to is that, we should be able to generate and evaluate options. There could be different equipment's in the market, which are available. We have to have a methodology by which, we are able to reduce the kind of information available for different equipment's in a manner, that the 2 equipment's can be compared, and an appropriate decision taken, so that, it is the best for the company.

We must remember that, as far as the investments are concerned, by construction companies, those companies are responsible to their shareholders, as far as the purchases are concerned. Somebody can question them that, ok, why did you invest in a 100 Crores equipment, or a 5 Crores equipment, when you knew that, it is going to last only 2 years, and so on and so forth.

So, there has to be a transparency. There is the process of accountability. And therefore, companies have to be sure, that the investments that they are making, are defensible. They can be defended, to the shareholders. So, from that point of view, we will talk in this course about, how to generate these options, and how to evaluate them.

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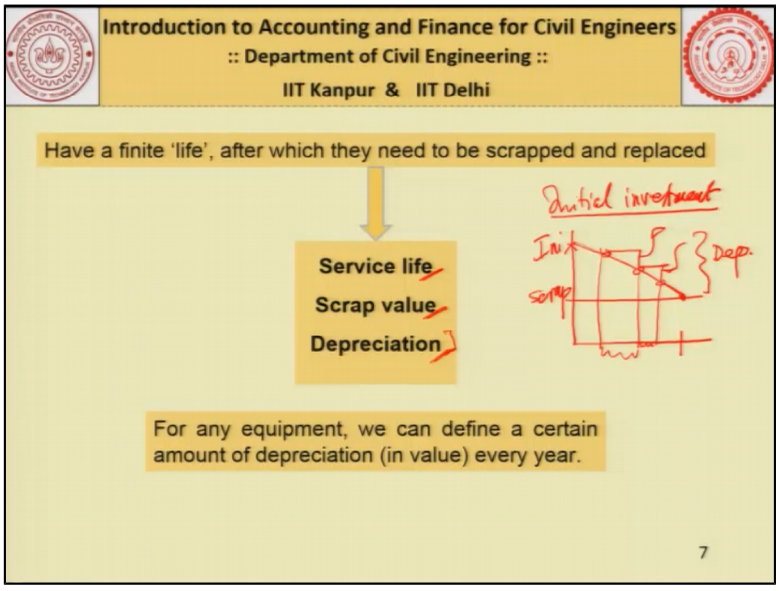

When it comes to this question of finite life, after which they have to be scrapped and replaced, what we must remember therefore is that, apart from the initial value, so apart from the initial investment that we make in the equipment, that is the purchase or the cost, there is

a service life, there is a scrap value, and there is depreciation. Depreciation is nothing but, the change in the value of that equipment, as time proceeds.

An equipment, which has a value something like this, which is the initial value, after its service life, has only, what can be called the scrap value. So, this change in value here, is the total depreciation that has occurred, as far as that equipment is concerned. Whether this depreciation occurs, linearly or not so linearly, that is something, which we talk about later. But, what this line or this curve would show is that, what is the value of this equipment, at different points in time.

So, this is something, which we need to address. What it means therefore is, that for any equipment, we can define a certain amount of depreciation in value, every year. So, if it was a linear case, we say that, okay, over this period of time, this is the amount of depreciation that has happened, over this period of time, this is the amount of depreciation that has happened.

Whether these two things are equal or not, is a different matter. That would depend on, whether we are taking linear depreciation or not. But, the fact is that, yes, there is a change in value over time. And, that is something, which has to be accounted for, and addressed, when we are trying to generate and evaluate options, as far as equipment's are concerned.

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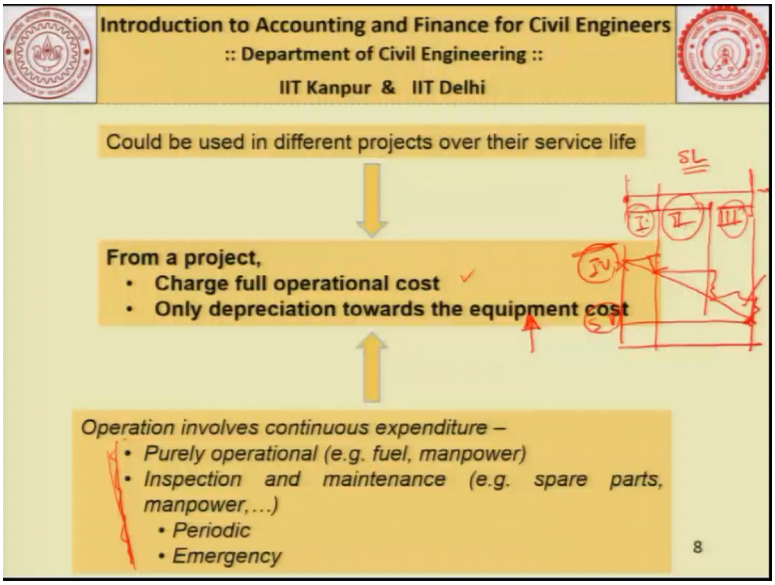

Now, when it comes to the issue of equipment's being used, in different projects over their service life, then we should remember that, there are expenses that are involved continuously. Let us say, this is the service life of the equipment. For this period, it is used in Project-1.

This period, it is used in Project-2. This period, it is used in Project-3. And, it may continue to be used, even beyond that point in time. But, that is something, which will talk about separately.

But, the fact of interest right now is that, if this equipment is used in these 3 projects, over its service life itself. That is, during this period, its value is changing from an initial value, to its scrap value. And, whatever depreciation is happening, what we have to determine is, how much is the cost of this equipment, to be charged to the project, whether it is 1, 2 or 3. So, what I am saying basically is, that from a project, what should be charged, as far as the fees, or as far as the cost of using this equipment is concerned.

So, the first thing is, that the operational costs, whether it is purely operational or inspection and maintenance, all that cost, must be charged to individual projects, wherever the equipment is being used. And then, as far as the initial value of the equipment is concerned, that can be charged in a manner that, only the depreciation towards the equipment cost, while it is being used in a particular project, may be charged towards the equipment cost, as far as a particular equipment is concerned.

So, going back to this particular example. If, in this project, this is the amount of depreciation that happened, this amount should be charged to Project-1, this amount should be charged to Project-2, and the remaining amount here, this is the amount that should be charged to Project-3. This is, as far as, this part is concerned. And, as far as the operational expenses are concerned, for each of these projects, they have to be charged in full. So, that is how, we can charge different projects, for using the equipment, that has to be built into the cost of those projects.

When we say, as a construction company that, we take up this project, or this project, or this project, for a certain amount of money, what that amount must include is, these kind of things altogether. For, all the equipment, full expenses, as far as the operational costs are concerned, and the sum of all the depreciation that occurs, at that project site. So, that is how we work, as far as estimating the machine cost is concerned, for the project cost.

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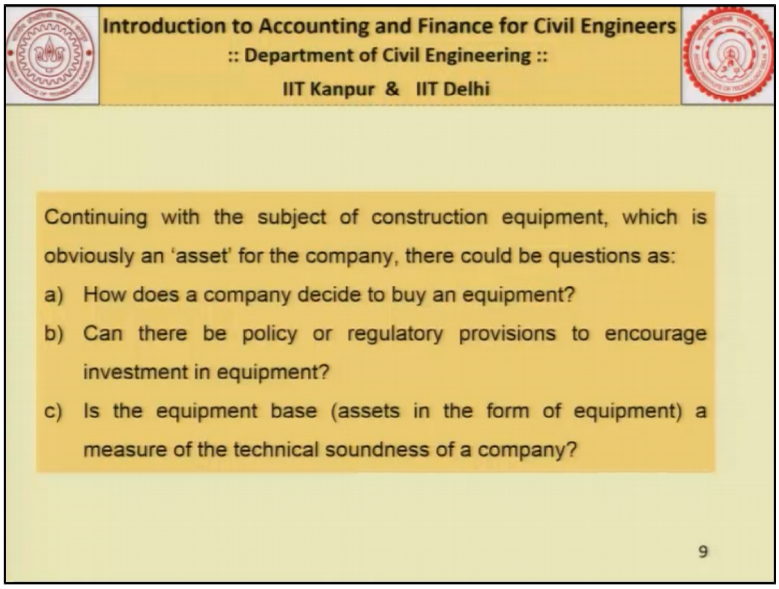

Now, moving forward, continuing with the discussion of construction equipment, which is obviously an asset, as far as the company is concerned. And, the technical definition of an asset is something, which we will do much later. We also need to answer questions such as, how and when does a company decide to buy an equipment? Can there be policy or regulatory provisions, to encourage companies to invest in equipment? And, is the equipment base, which is the assets, in the form of the equipment, a measure of the technical soundness of a company. Now, let us try to answer, these questions, one by one.

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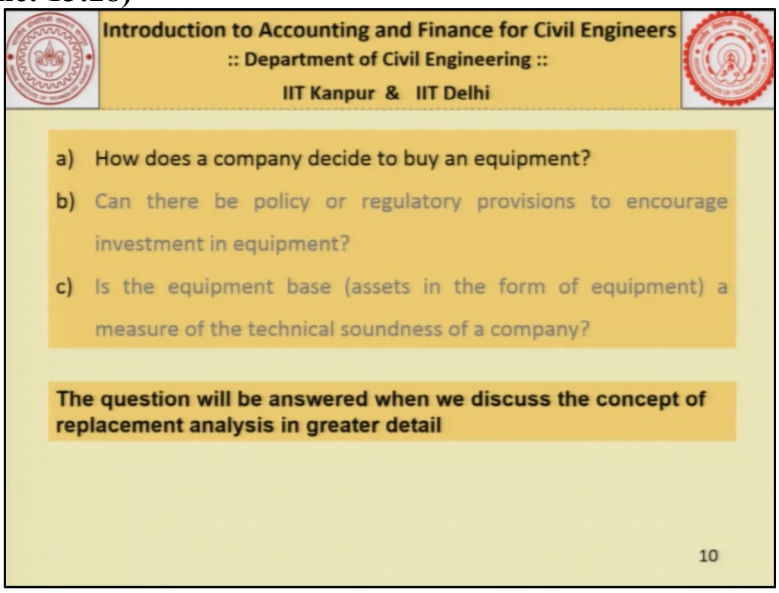

The first question is; how does a company decide to buy an equipment. This question, I am not going to discuss, right now. It will be answered, when we try to talk about Replacement Analysis in greater detail. You would recall that, that something which Professor Jha had

talked about very briefly, when we were doing the first lecture, and we were trying to introduce the whole course to you.

Now, as far as the second question is concerned, can there be a policy or regulatory provision, to encourage investment in equipment. Now, as far as this question is concerned, let us have some kind of basic discussion. It is not drawn from actual provisions. But, it is laid down here to give you an idea, as to how policy and regulatory provisions help in, encouraging companies to build an equipment base.

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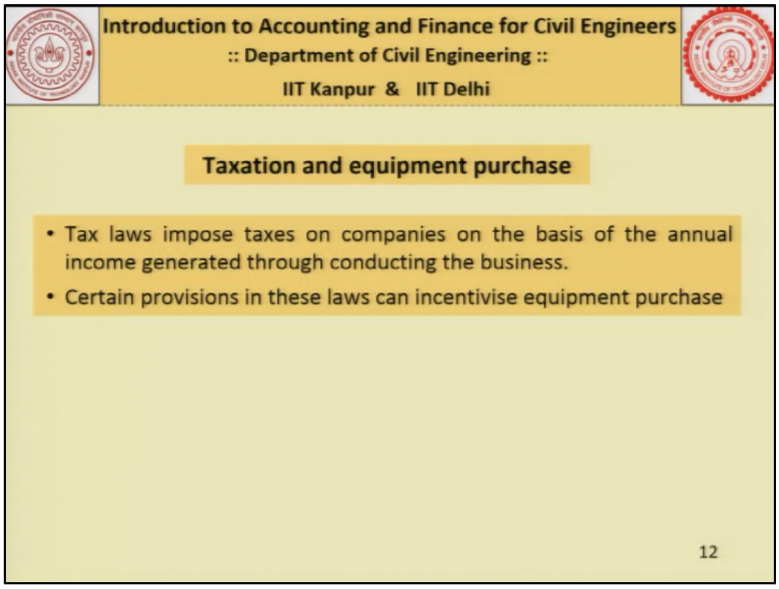

Let us consider, how taxation and an equipment purchase could be related. Tax laws impose taxes on companies, on the basis of the annual income generated through conducting the business. And, certain provisions in these laws can incentivise equipment purchase. How does it work?

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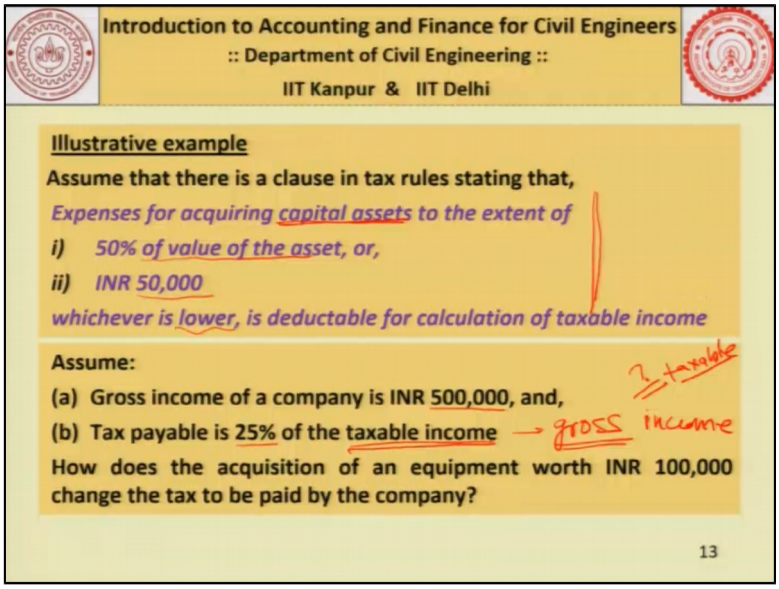

Let us take an illustrative example, which is given here. Assume that, there is a clause in tax rules, that states that, expenses for acquiring capital assets. Now, we are using the term, capital assets. And, construction equipment is very much a part of capital assets. If the tax provisions state that, as far as acquiring capital assets is concerned, 50% of the value of the asset, or let us say 50,000 Rupees, whichever is lower is deductible for calculation of taxable income.

What it operationally means is that, if there is a company, which has a gross income of, let us say 5 Lakhs, and these provisions were applicable, and the tax rate is, a flat 25% of the taxable income. I will draw your attention to the use of the word, taxable income. This is different from, gross income. So, there is a gross income, that the company has. And, from that, what we have to determine is, whether this gross income is simply equal to taxable income or not.

Now, if it is equal to taxable income, then there is no discussion. But, most of the time, there are certain deductions which are allowed, before the taxable income is calculated. So now, as far as acquisition of assets is concerned, if these were the kind of provisions which were available, that 50% of the value of the asset, or 50,000 whichever is lower, is deductible for calculation of taxable income, from the gross income, and this was the data.

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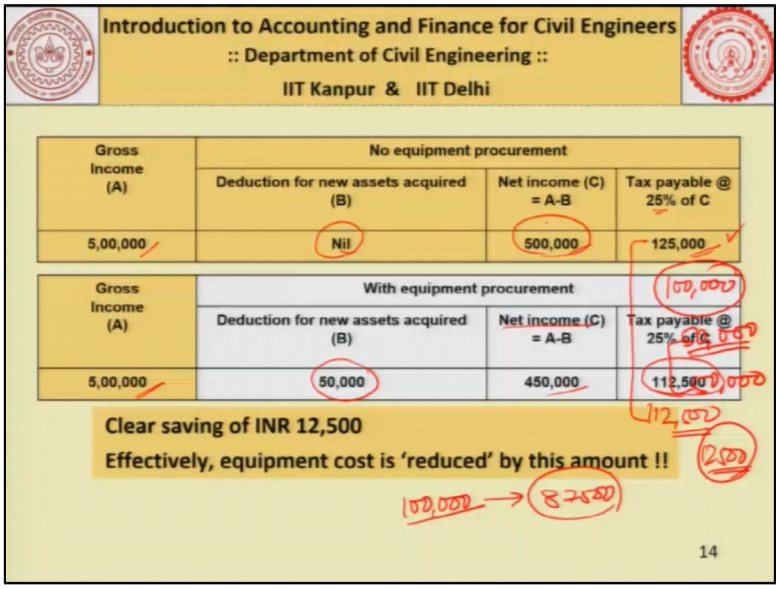

Then, how does the tax liability change? So, in the first case, if there is no equipment procured, the gross income is, let us say 5 Lakhs, you have not done anything here, so your net income as far as taxable income is concerned, is the same. And therefore, the tax payable is 25% of this amount, which is 125,000. Now however, if you have acquired, or the company has acquired, an asset worth 1 Lakhs, which is what was stated in the previous line.

So now, 50% of this, which is 50,000, or the absolute value of 50,000. So, in this case, the numbers are such that, these two numbers match, this is what is deductible from the gross income, before you calculate the taxable income. Which means that, an amount of 50,000 can be removed from here, and your net taxable income becomes 4,50,000, and the tax payable is 112,500 Rupees, which is 12,500 lower than what you are paying, if you had not bought any equipment.

So, what it says is that, there is a clear saving of 12,500. And effectively, the equipment cost is reduced by this amount. Because, this amount would not have remained with you anyway. So, this asset, which you bought, which was for a 100,000, has actually cost you only 87,500. Because, this 12,500 is something, which you have saved, as far as taxation is concerned. So, this is one way of looking at, how taxation provisions could incentivise equipment purchase.

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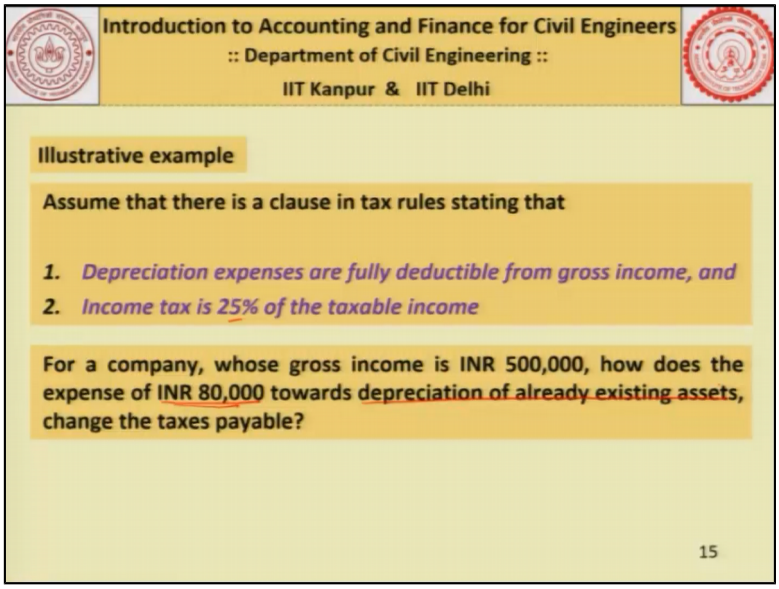

Taking, another example. If for example, depreciation expenses are fully deductible from gross income, if there was another provision like this. And, the income tax slab is again 25%, as in the previous example. And, we have a situation where, by use of equipment, there is an expenditure of 80,000 towards depreciation of already existing assets, how does that change the taxable income and the taxation.

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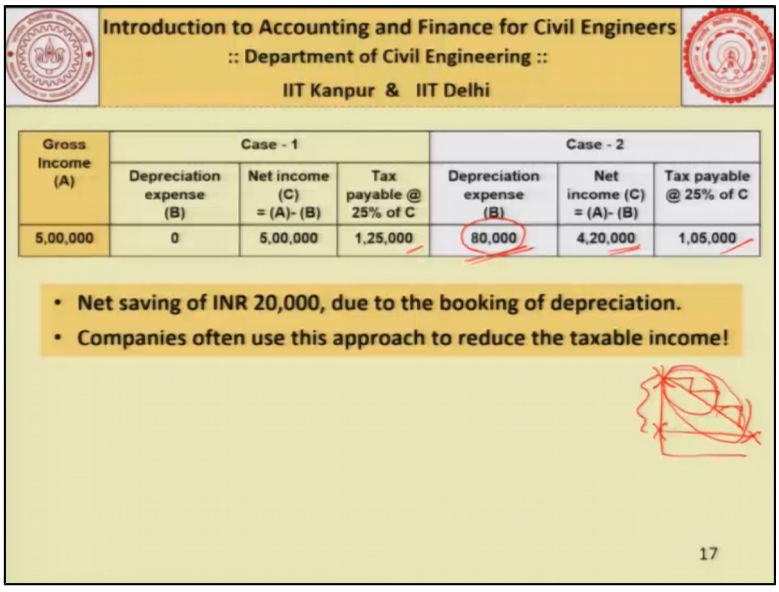

For that, obviously, if you do not have any depreciation expenses, and given the fact that we are still working with the 5 Lakhs gross income, and that is the example that we took earlier, then taxable income remains the same, and the tax liability or the tax payable is 125,000, without any change. However, if we have a situation where, there is an 80,000 which is admissible, as far as depreciation expense are concerned, then the net taxable income becomes only 4,20,000, and the tax payable is 105,000, as against 125,000.

Which means that, you are saving 20,000, because of booking 80,000, as far as your depreciation expense are concerned. Now, this actually is something, which we will discuss in greater detail, when we do depreciation of equipment. Because, the companies could be interested, in enhancing the depreciation rates, at a given point in time, so that they can book more and more expenses, as depreciation expenses.

And, that is where I would like you to recall, that what we had said was, linear depreciation. And, that is the simplest model to work with, is not necessarily what is the best model, as far as companies are concerned. They may be interested in a situation where, instead of the depreciation being equally distributed over the service life, they may like that, in the initial part of the use of that equipment, the depreciation expenses are more.

That is, more expenses are admissible as depreciation expenses, than later, even though the initial value and the salvage value, these do not necessarily change. So, but that is something, which we will come to later, as far as this class is concerned. Sufficient to understand, that there are provisions, or there could be provisions, which enable companies to login depreciation expenses, purchase of equipment expenses, and thereby reduce their taxes. Please understand that, that does not mean that, they are dishonest, as far as tax payments are concerned.

It is the provisions, that exist. And, those provisions are being used, to create assets. So therefore, if there are provisions socially and legally, which allow companies to invest, as far as equipment's are concerned, as far as their maintenance is concerned, that is a perfectly legitimate way of doing business. So, companies often use this approach, to reduce the taxable income.

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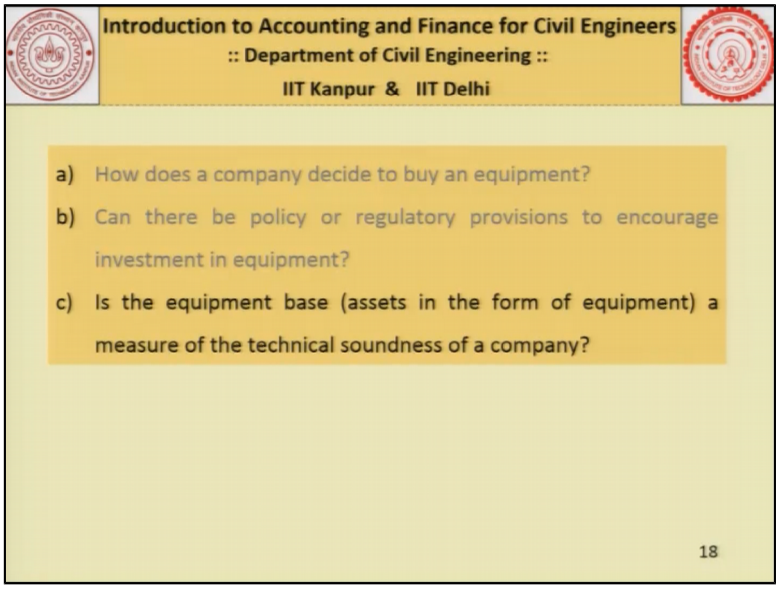

Now, coming to the last of these 3 questions, is the equipment base, that is, assets in the form of equipment, a measure of the technical soundness of a company.

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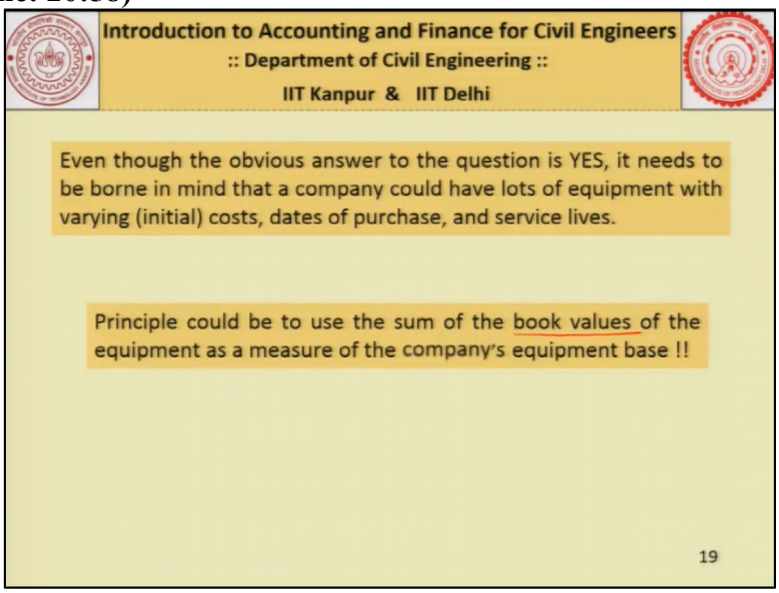

To that, even though the obvious answer is yes, it needs to be borne in mind, that a company could have lots of equipment, with varying initial costs, dates of purchase, and service lives. And then, how do we calculate the equipment base of a company, at a given point in time. The principle could be, to use the sum of the book values of the equipment, as a measure of the company's equipment base.

The term here is, book values. That means, there is something like a book value, of every equipment. And, that book value is something which you arrive at, by removing the, all the depreciation that has occurred, as for as that equipment is concerned, from the initial value of

the equipment. And, this discussion, we will repeat, and do with a little more rigour, when we discuss this issue of depreciation, in a subsequent lecture. Now, coming to an end, as far as this lecture is concerned.

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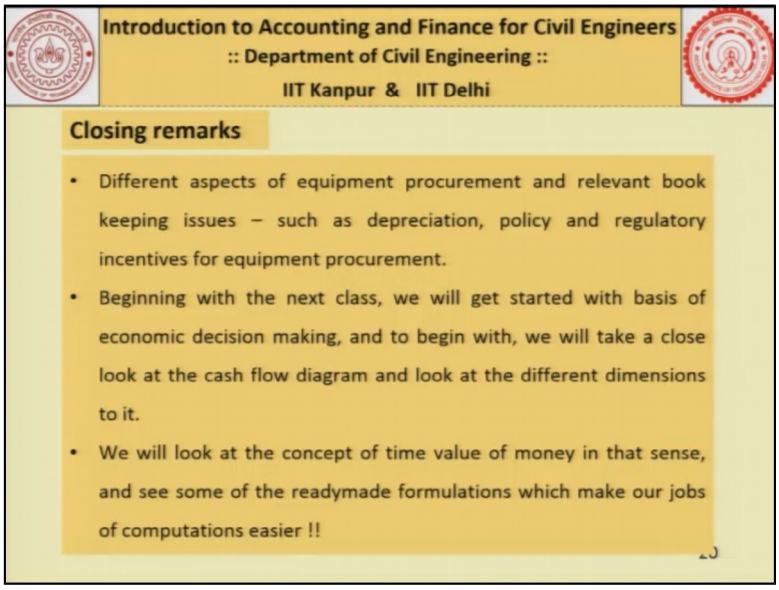

Let me close by saying that, what we have done today, is discussed, different aspects of equipment procurement, and relevant book-keeping issues, such as depreciation, policy and regulatory incentives for equipment procurement. And, beginning with the next class, we will get started with, the basis of economic decision-making. And, to begin with, we will take a close look, once again at the cash flow diagram, and look at some very interesting dimensions of that diagram.

We will also look at, the concept of time value of money in that sense, and see some of the ready-made formulations that are available, which make our jobs of computation, easier. And, with that, we come to an end of our discussion today. Thank you. And, I look forward to seeing you, in a subsequent discussion.