E Business
Professor Mamata Jenamani
Department of Industrial and Systems Engineering
Indian Institute of Technology Kharagpur
Lecture-57
Introduction to Auction

Welcome back in continuation with our last lecture on dynamic pricing where we learned that dynamic pricing is very natural and it has it is convenient to implement fixed pricing that is why people were going for fixed pricing but because of Internet, now again dynamic pricing has become a reality. So in this context we saw there are many dynamic pricing models out of which we have chosen to discuss about auctions. In today's class we are going to learn about different kinds of auctions, how to classify auctions and look at few applications if possible.

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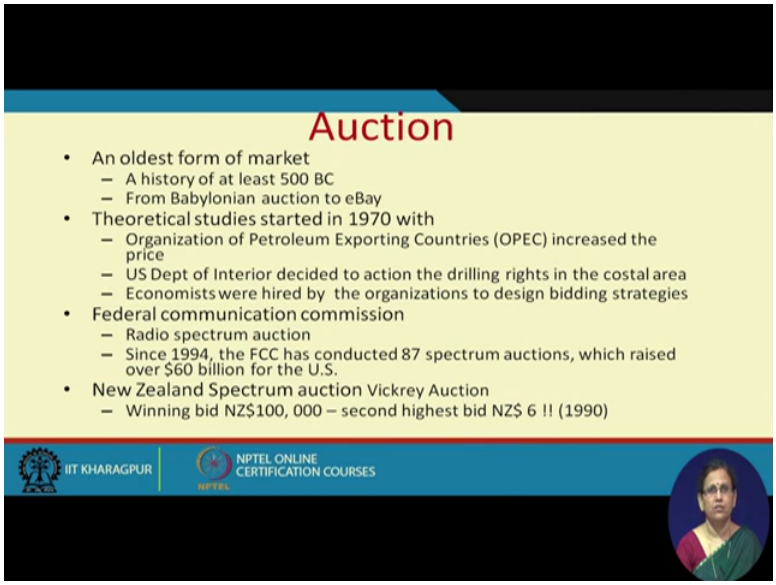

Now what are auctions? Auctions are again very oldest form of market. In fact if you look at the history, probably you can have the evidence of auction being happening even before price even I mean the, it has the written history of at least 500 BC. And the auctions like that of your reverse auction or auctions at EBay and similar such sites are the recent phenomena which is which means this auction has always been there and will be there. This is because as we know this provides a first-degree differentiation where actually the price can be decided based on the demand and supply conditions.

Now, example of this auction is not limited to online buying, in fact starting from your spectrum auction for which there has been certain I mean even in India people were talking about this auctions and all for selling spectrum and the selling spectrum to auction is very

old. In fact, it started with in fact this selling spectrum is started with selling of in 1995 where Federal communication commission conducted 87 spectrum auctions which are raised over 60 billion dollars for the United States. However, if the auctions are not designed properly there are some failure stories of auctions as well, you can make some readings about that how this Vickrey auction so-called it is a very important auction phenomena auction type auction mechanism which has failed once in 1990 where the winning bid was a very high price and the second winning bid was very low price.

In fact if you look at the theoretical interest on auctions around 1970, when the US again decided to to sell the drilling rights of its coastal area for oil exploration, economists were hired by the organisation to design the bidding strategy to participate in this auction so let us try to classify this auction.

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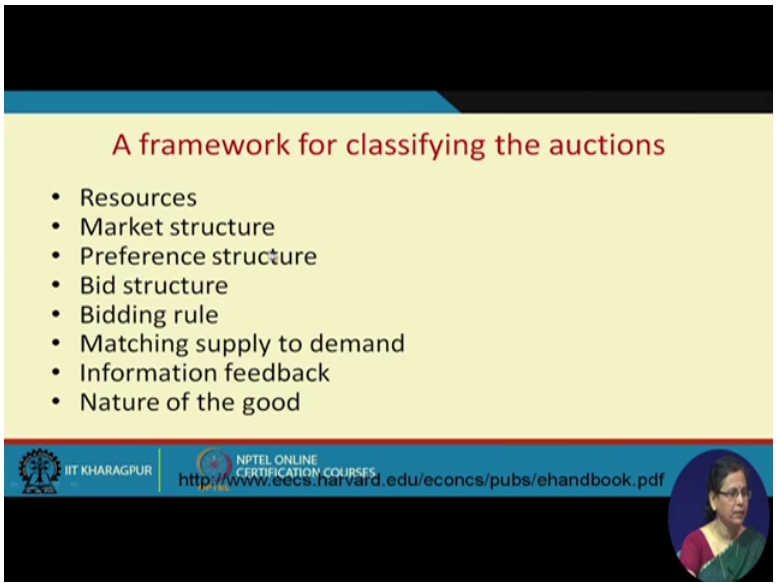

Auctions can be classified in many different ways, we are going to look at each of them separately.

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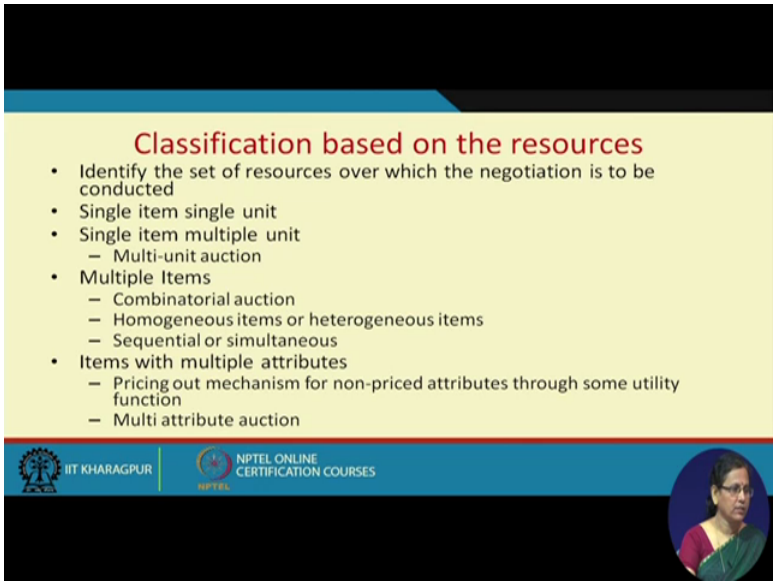

So first one is you can have the classification based on the resources. To identify the set of resources over which the negotiation is to be conducted, either it can be single item single unit, it can be single item multiple units, it can be multiunit auction, it can be multiple item auction, now what is a single item single unit? Let us say old painting is getting sold, single item single unit. Organisation is buying some important equipments using auction single item single unit, there can be single item multiple units, organisation is deciding to buy multiple unit of certain items let us say some biscuit company is trying to buy 100 quintal of sugar through reverse auction, same item multiple units okay.

Then you can have multiple items, different items are being tried to buy or sell together. In the first case it was single item with multiple units, here you have a scenario in which he was trying to buy or sell multiple items together. So when we try to buy this multiple items together, this particular type of auction is called combinatorial auction. Again it can be made complicated, multiple items and multiple units, this can be multiunit combinatorial auction. Similarly, you can also have items with multiple attributes, besides price the other attributes such as various quality parameters, etc can be associated to make the buying and selling possible. So which means those attributes has to be now converted in terms of price or some other mechanism has to be adopted to implement such auctions okay.

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Then, auctions can also be classified based on the market structure, now what is this market structure all about? You can have one seller and multiple buyers which is the traditional form of auction. In the traditional form of auction usually when some house or some property is getting auctioned or some very precious good is getting auction so you can have forward auction, one seller is selling and multiple buyers compete among themselves to buy. Your auctions on Ebay etc are one seller multiple buyer auctions as well. Then recently because of the Internet it is possible to have auctions in which you have one buyer and multiple sellers.

Traditionally, to purchase any items in an organisation there used to be bidding and tendering, in that tendering the buyer expresses his requirement and impact when we studied about E procurement, that time we discussed about all these issues. The buyer expresses his interest and request for quotation then many sellers respond. So if you have one buyer and multiple sellers, it is called a reverse auction it is not a very traditional form of auction, it is a recent phenomena because of this, traditionally this used to be tendering process because in tendering process it is a one-time submission of bids.

Now because of online environment now it is possible that it can happen in multiple layouts and the sellers can compete among themselves so in that case it is called reverse auction otherwise if the all submit their bids at a time, it is called E-bidding system but anyway now we are talking about auction so it is called reverse auction. Then if you have multiple buyers and multiple sellers, this kind of situation happens in case of stock market so in case of stock market if we have multiple sellers and multiple buyers competing among themselves to buy

and sell securities financial security, so those are called double auction okay. So based on classification of this classification will be based on the market structure.

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Next class next classification is based on the bidding rules, the kind of bidding rule used for bidding valuation. Some auctions can be ascending bid auctions, in case of ascending bid auctions which happen in case of forward auction, in forward auction you have one seller multiple buyer right. So 1 buyer takes one price then it is outbid by the second bidder the second bidder price is again outbid by another bidder and so on and then again first bidder may try to outbid, so the bid value keeps increasing somebody is telling I will be buying the product at 10,000, next person is telling 10,500, next person is telling 11,000 and so on, so in this situation the buyers compete among themselves and increase the price okay.

So your English auction is of English auction is basically your traditional auction, why it is called English auction because basically it is because we call it in English Outcry auction, you must have seen you must have seen that when in a traditional auction house something gets sold, they sell they say let us say 5 lakh 5 lakh 5 lakh then somebody outbids with 10 lakhs then somebody, so it is somebody actually stands in front of a crowd and shouts so this is called English outcry auction so it is basically ascending bid auction.

Then next is your so you are in this ascending bid auction there are 2 important issues; one depending on the nature of the product some initial price is set, below that price people are not allowed to bid let us say house is getting auctioned, you cannot offer 10 rupees for a house right there will be some minimum base price above which there will be auction so that

reserve price must be decided in such auction. Then another issue here is the increment, let us say house is getting sold and its initial price is let us say 50 lakhs, next increment the increment on this Rs 50 lakhs, increment of 50 rupees looks ridiculous here, so minimum increment may be 1 lakh or 2 lakhs or 5 lakhs, that has to be decided based on the situation.

Now if let us say some other item like like a laptop is getting sold on Ebay, initial price it started with 20,000, so increment can be in hundreds or in thousands, it cannot be in lakhs right so therefore this minimum increment has to be decided in such auctions as well. Then next is your descending bid auction, descending bid auction also has a name, they are called Dutch auctions. In these Dutch auction, these Dutch auctions are actually named after the Dutch flower auction in which it is again one seller multiple buyers but that seller himself starts at a very high price. In case of flower, as the time progresses the flower, the quality of flower deteriorates, it becomes at some point of time it is it becomes actually have to throw the throw the flower, it is no more people can take, the more fresh it is the price is very high.

So initially the buyer will be asking for a very high price, as the time progresses the buyer himself decreases the price. When the buyer decreases the price, the moments one person response the item is sold, it is just opposite of that of English auction. The buyer the buyer starts with some minimum price then bidders keep on increasing the price and the moment no further increase happen, the item is sold to the person who provides the highest price. In case of Dutch auction you start, the buyer starts with a high price and keeps himself decreasing the price till one person response and takes the product so this is called Dutch auction.

Then next is your sealed bid auction, the sealed bid auction is the one in which this increase or decrease of price interactively is not allowed. At a time in a sealed envelope everybody submits the bid and bid is opened at a particular time okay. So in case of this sealed bid auction there are again 2 varieties, one is a first price auction, another is called second price auction. In case of first price auction whosoever is the highest bidder, he gets the item with the price he suggests. In case of second price auction, the highest bidder gets the price gets the item but the second-highest bidder’s price, so which means he gets the price advantage which is the difference between his own bid value minus the second person’s bid value.

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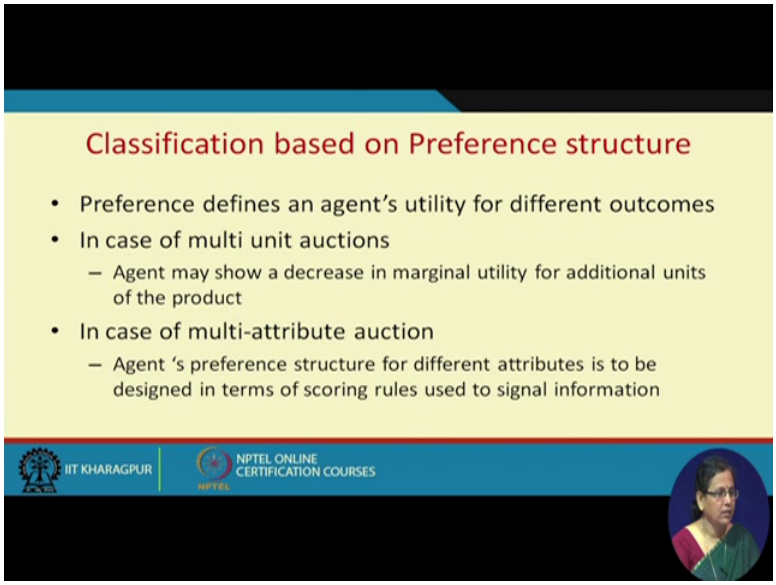

Then this can be classified based on the preference structure of the buyer or a seller. Now consider

a scenario in which you are buying multiple units. So with when the number of units available is less, you might be willing to pay more, but as you the number of units increase, you may not be willing to pay. So decrease in the price I mean you decrease, if you find out decrease in the marginal utility of utility for an additional unit of products offered in case of multiunit auction, you can say you have your utility is changing and you have your preference structure is different for different units. Similarly, your preference can also depend on the kind of attributes besides price offered by the item. By attribute we mean different quality and service let us say some 2 items you are going to compare.

Price is same but the warranty in one of the items is the warranty period in of the items is more naturally you will prefer the item with higher higher warranty. Now prices are different, first item with lower warranty has less price with higher warranty has high price. Now you can have your own utility function established by utility function we mean a mathematical see after all this evaluation has to take place in online environment using some kind of function. So in such situation when you are considering multiple attributes, you should have a methodology for constructing a function which relates all the attributes and finally this combination is expressed in some kind of monitoring or some kind of other dimensions dimensionless way it can be expressed by combining everything together.

Either it can be priced out, everything is represented in terms of price including your warranty and other quality attributes or everything including your price can be reduced to some dimensionless stuff which can be combined together, then you can also classify based on the bid structure.

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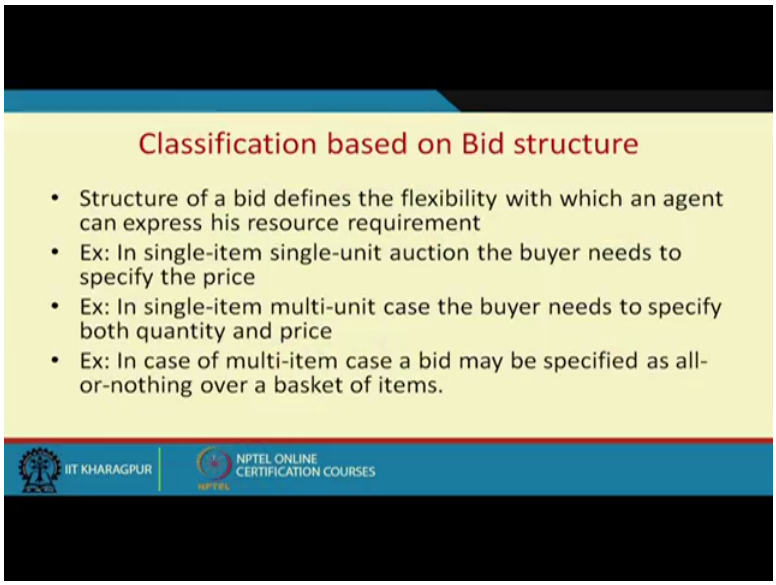

Okay what is the bid structure? The structure of a bid defines the flexibility with which an agent, what is an agent here? In fact we have been talking about the term agent so many times, the agent is basically a buyer or a seller, the person who is involved in this auction process. So the structure of a bid defines the flexibility with which an agent can express his resource requirement. Now in case of single item and single unit auction, the buyer needs to specify the price only, now in case of single item multiple unit the buyer need to specify not only the price but also the quantity. Not the bid is price-quantity pair, in the first case it is price only, in the second case it is a price-quantity pair. In case of multiple items the buyer can specify which items you would like to buy.

Let us say 5 items is getting sold, so the bid structure will be for A B let us say items are A, B, C, D, E. For A B this is the price, for C D if I am buying this is the price and so on, so it is the list of items and price. Then the classification can also be made based on the payment rule.

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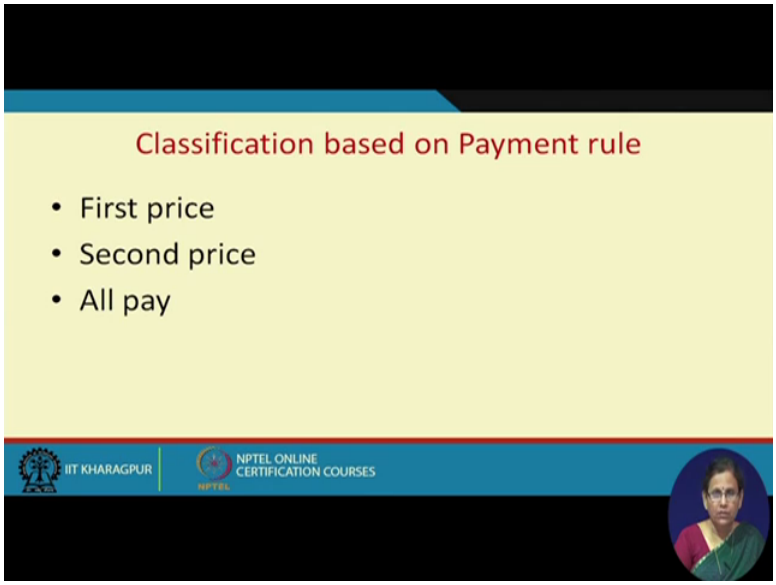

In an auction, in a forward auction, consider a forward auction scenario. If the highest the person whose bid is of highest value will definitely getting that and price of that price that he pays is same as that of his bid value that is called first price auction. The payment rule is the highest bidder gets the item and pay whatever he bids. The second price auction, again the highest bidder gets the item but he gets, but what he pays is the second-highest bidder's price, this is also called Vickrey auction, now why such a strange auction that we will be discussing after sometime possibly. Then there are auctions which are All pay, everybody will be paying some amount some reserve amount just to participate then there will be bidding then the highest bidder will be getting the item, this is your this is another scenario.

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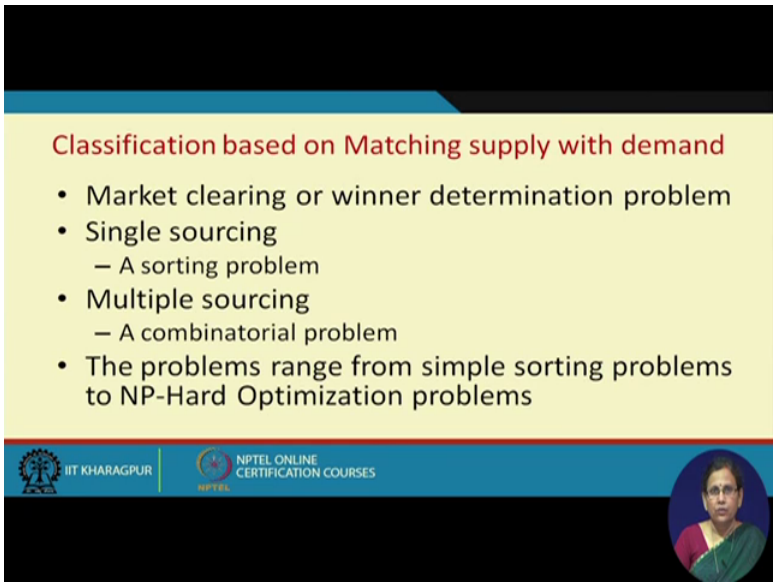

Then you can have classification based on matching supply and the demand. So here depending on the kind of auction there will be different kind of winner determination problem, how winner has to be decided based on based on the kind of item which is bought which is getting sold or bought and so on. Now if if we may decide that we will be buying from only one source or selling to only one source, which means I have only one item or even in case of multiple items, I will be selling or buying to only one person, it turns out to be a very simple sorting problem.

Then I can decide for multiple sourcing, I can buy from I have demand from multiunit items or multiple items and one source is not able to provide me all the items so I can buy it from multiple items or if I have many items and one single buyer is not willing to take all of them, I cancel it to a group of people, so basically this multiple sourcing problems are combinatorial problems and quite compositionally hard problems.

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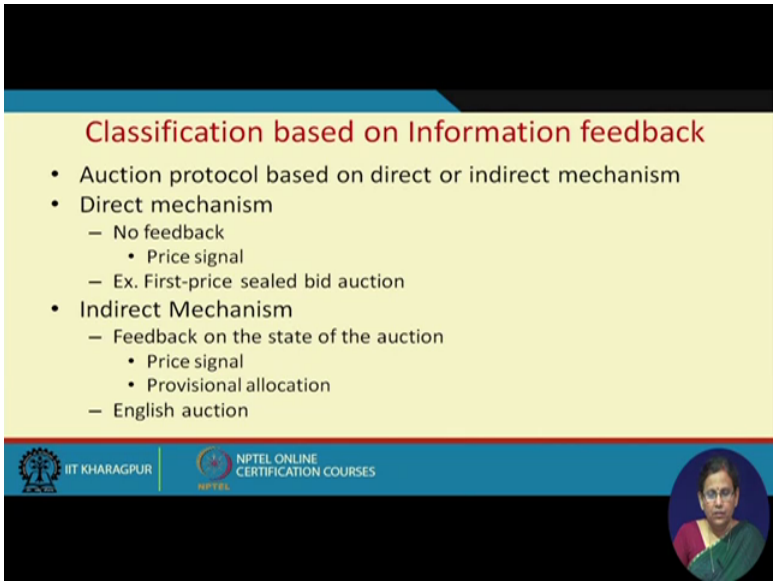

Then you can have this classification based on the feedback mechanism. There will be certain auction mechanisms in which no feedback will be there, there will not be any feedback. In case of online tendering in using this first price or second price auction people will be submitting their bid in a sale envelope at one go, they do not have any kind of feedback mechanism to change their bid, whatever they submit that is final. Then there are certain auctions like that of English auctions where the current highest bid value is known so which means this current price signal goes to all the bidders and accordingly they bid okay.

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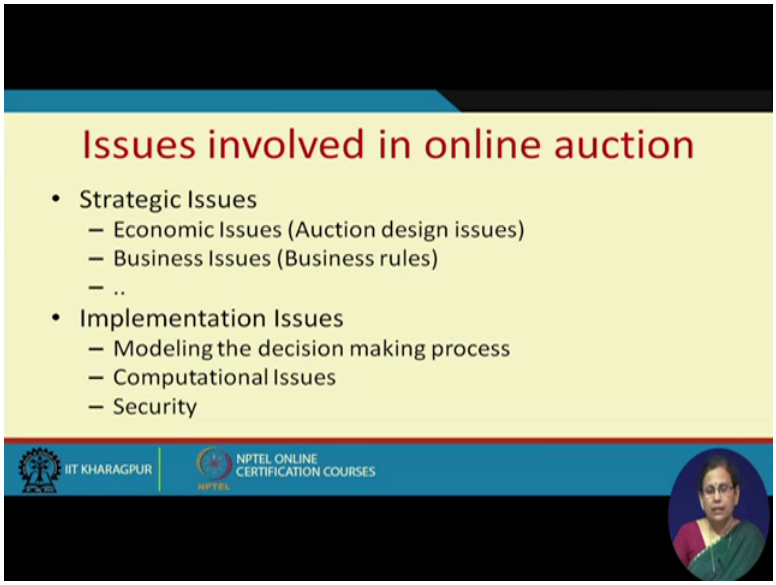

Then when we talk about online auctions many issues are involved; first one is your economic issue which basically talks about your auction design problem. Then you have business level issues which is about including business rules like what should be my reserve price, whether I should go for single sourcing or multiple sourcing and so on. There are many implementation issues as well. Framing the corresponding computational problem which is an optimisation problem and solving it online is a major issue besides that because the bids values are supposed to be kept secret when this information exchange takes place, security is another issue which is to be dealt with. So with this we finish this lecture, thank you very much.