Petroleum Economics and Management
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Module - 02
Basics of Microeconomics
Lecture - 06
Analysis of demand

Hello, I am Dr. Anwesha Aditya your instructor for the course Petroleum Economics and Management. We are in module two of our course where we are just brushing up and studying some concepts of economics, especially related to microeconomics. In the first lecture of module two, we have already given brief overview of what is economics, we have distinguished between different branches of economics.

And we have also talked about the basic concepts of economics like what is market, what are the different types of market because market will be a major focus of our course petroleum economics and management. If you see the course outline, we will be studying about the world, oil market, we will study the theories of price formation, we will study the market structure of the petroleum industry and we will study the price trend of the global oil industry.

So, for that we need to know how prices are formed in a market; so, for that we need to know what is a market and how prices are decided.

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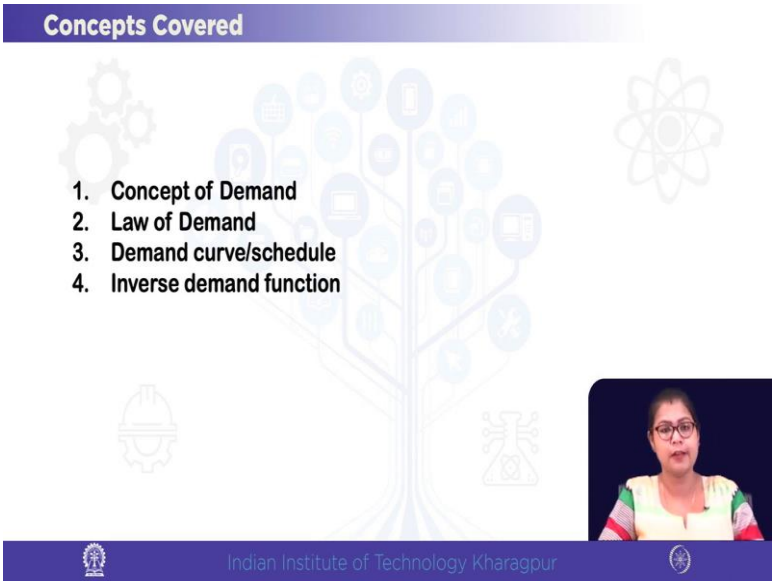

So, we already defined that by market we do not refer to a particular geographical location or any online portal. Rather, market is mechanism in which there are two parties in a market, they need not meet each other physically, but we; obviously, need two parties to have a transaction in a market; so; that means, in a market there are two sides.

So, from today's lecture onward now what we are going to study is the two sides in a market. So, there are two sides, the demand side and the supply side or the consumers and the producers in a market. So, we will be studying these two sides separately and then we will be putting the two together to see how prices are formed and equilibrium quantity is decided in a market.

If we say that this much of petroleum was sold in a particular year; so, how that is decided. Or this was the price is increasing decreasing; so, how do you know that prices are formed? If there is a demand shock like that happened during the COVID-nineteen pandemic. How a demand shock affects the world oil price; so, for this we need to know the demand side and supply side in a market.

So, in today's class we start with the concept of demand; so, we will study these two sides, the demand side and the supply side of a market separately and then we will put the two together to find out the equilibrium. So, in today's class we will start with the demand side of the market. So, what do we mean by demand, then we will study the law

of demand, and we will get the very important function which is known as the demand function.

We talk about the different types of demand function, the direct and the inverse form of the demand function and we will also explain what do we mean by a demand curve. In the subsequent lectures we will be going to the supply side as well; so, let us today focus only on demand.

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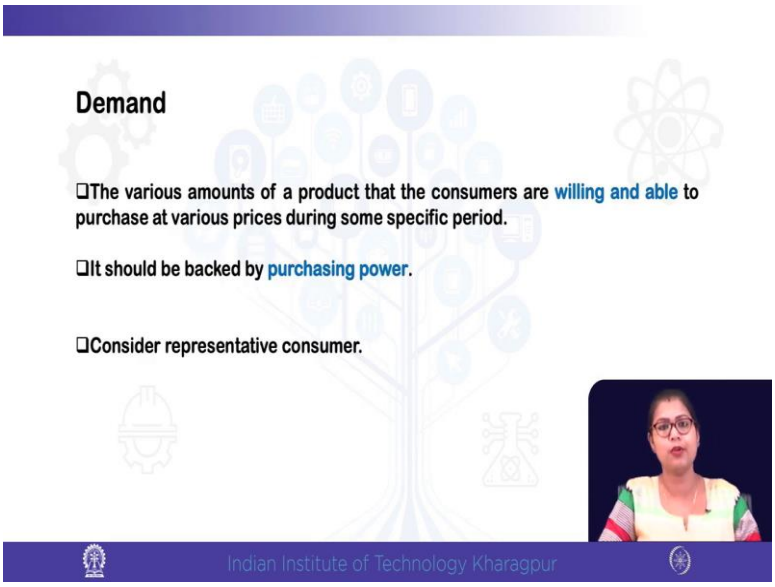

So, what do we mean by demand? Demand may refer to wish, want in a literary sense. But, in economics when we refer to demand it may not be just a mere wish or want, why? If I say that I want to have the costliest car that is available in the market or suppose I want to have apartment in the tallest tower in Dubai say Burj-Khalifa is it my demand, no?

In economics these are not the demands, because I cannot afford. So; that means, in economics demand means something which a consumer can afford; so, demand is backed by purchasing power. We already defined purchasing power; purchasing power means the ability to afford a particular good or service. So, with this we now define demand which is the amount of a product that the consumer is willing and able to purchase at various prices during some specific period of time.

So, we should be careful about this; so, it is not only the consumer's willingness, but also it is the ability to purchase. So, in a literary sense, demand wish want they are synonymous, but not in economics. In economics demand must be backed by purchasing power, then only we can consider a particular commodity as a demand for a consumer.

Now, in microeconomics as we already discussed that it deals with individual economic agent; so, we talk about the individual representative consumer. And then before going to the equilibrium will add the individual demand to get the market demand for all the consumers or all the individuals in the economy. So, in today's class we start with a representative consumer.

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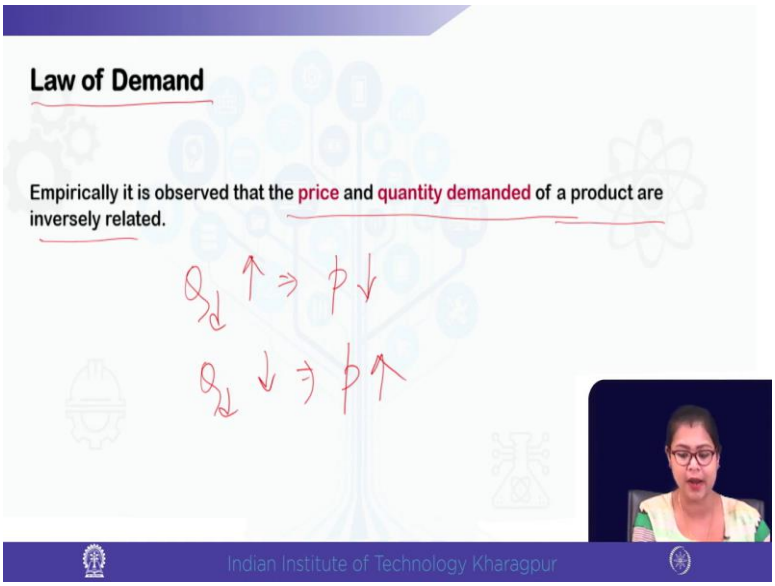

So, generally what we see? Empirically we see that when price of a good increases, quantity demanded falls or if price of a good falls, quantity demanded increases. Say for example, when the festive seasons come; so, there is lot of discounts going on; so, we buy more of garments, accessories as well as electronic products. If you find more discounts people buy more; so, quantity demanded increases as price falls.

So, we see that price and quantity demanded of a good are inversely related; so, this is called the law of demand. This is not a theory as we all know that law is something which is empirically observed, and theory is something which is based on some assumption and the results are derived contingent upon the assumption. So, this is called the law of demand, because this is what we empirically see in most of the cases.

There may be some violations, but we are not going into that detail of microeconomics then we have to devote more classes of microeconomics and we will have less time to cover our petroleum economics and management related topics. So, the purpose here not to study microeconomics, but to study those parts of microeconomics and economics overall which will be required to study the course petroleum economics and management. However, in the interactions if you have any doubts it will be address definitely.

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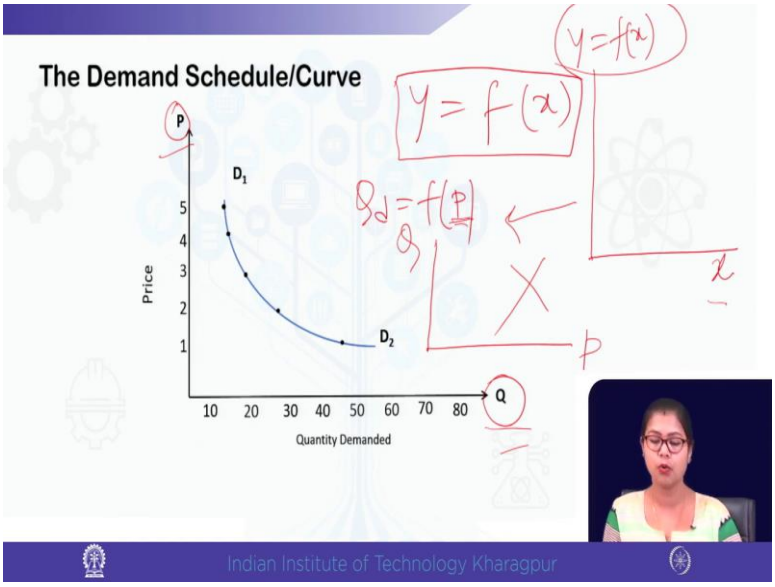

Now, with this we plot the price quantity data and we can get the locus which is called the demand curve or the demand schedule.

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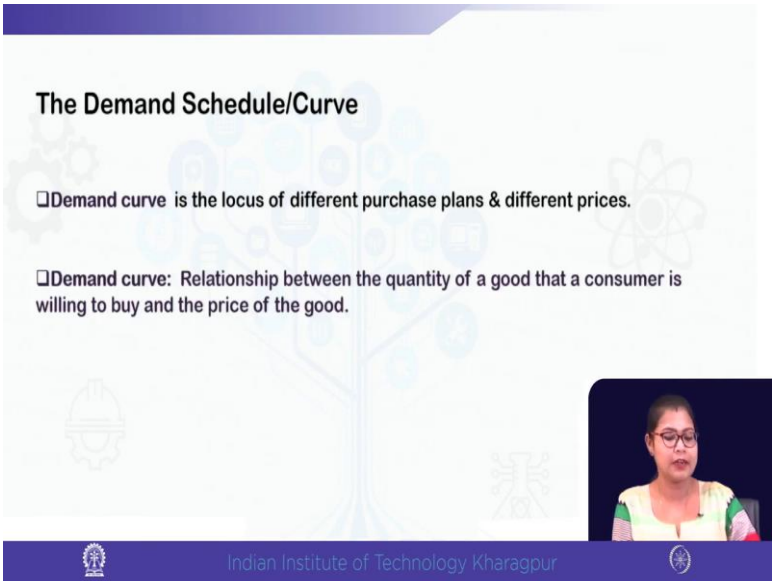

So, demand curve is the locus of different purchase plan at different prices or it can also be defined as the relationship between quantity of a good that the consumer is willing to buy at different prices. Now, so, this is the plot of the demand function and you can see that we have plotted price and quantity and the locus we have got relating the price and quantity is called the demand curve. Now, can we find any anomaly in this figure; so, here you can see that we have plotted price on the vertical axis and quantity on the horizontal axis.

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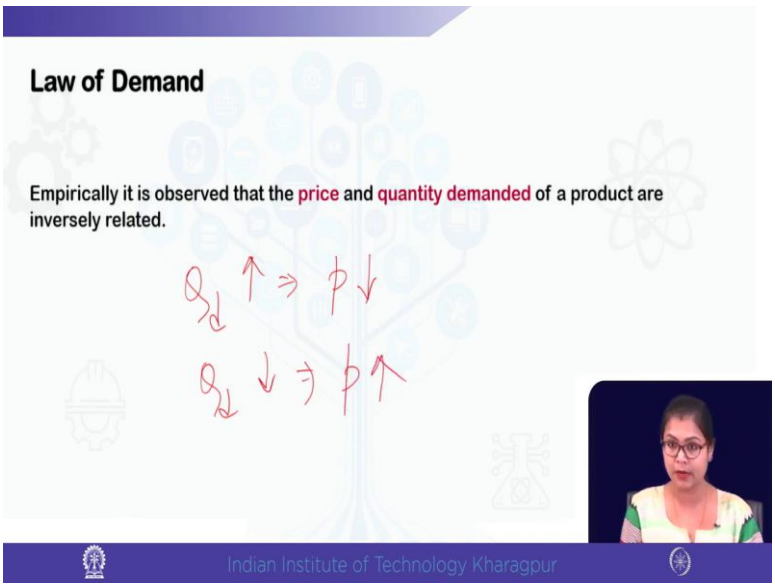

And what we discussed just now in law of demand? We discussed that price and quantity are inversely related. So, as generally empirically we see that quantity demanded increases as price falls; so; that means, what? That means, quantity demanded of a good depends on its own price. And of course, there are other factors as well on which quantity demanded depend and we will discuss those other factors also.

Like for example, income, weather or price of related goods; for example, demand for petrol can fall if say price of diesel is changing. So, we will discuss all this, what are the other factors on which demand for a particular good depends upon. So, for the time being let us just focus on the relationship between quantity demanded of a good and price of a particular good.

So, we see that the law of demand tells quantity demanded increases as price falls and quantity demanded will fall when price increases ok; so; that means, quantity demanded is a function of price. So, in this sense if we now look at this figure which is drawn in the slide, we see that price which is the independent variable is on the vertical axis and the quantity which is the dependent variable is on the horizontal axis.

Now, if we take a general figure like y equals to f (x), how do we plot such a graph? Such a functional relation is plotted where y which is the dependent variable comes in the vertical axis and the dependent the independent variable x is plotted on the horizontal axis this is the convention we know. So, this is how we plot a functional relation y equals to f (x), the dependent variable is plotted on the vertical axis and the independent variable is plotted on the horizontal axis.

With this if we now write the demand function Q_d as a function of P; so, how should we draw then. So, here quantity demanded of a good depends on price and that is the demand function; so, quantity demanded is the dependent variable; so, as per convention the dependent variable appears on the vertical axis. So, we should have plotted quantity on the vertical axis and the price which is the independent variable should appear on the horizontal axis, but you see we have just plotted the other way.

So, if we plot as per convention following this y equals to f (x) function. So, if we plot quantity demanded the dependent variable on the vertical axis and price the independent variable on the horizontal axis, we are wrong this is not the right way to draw the demand function ok. So, in demand function, the price which is the independent variable

is plotted on the vertical axis; whereas, quantity the dependent variable is plotted on the horizontal axis, why so?

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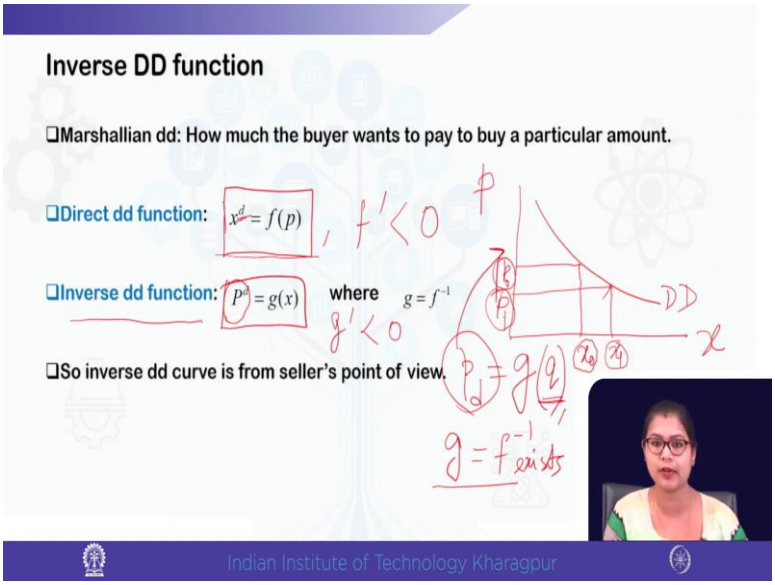

Because, we are actually not plotting the direct demand function, what we are doing here is, we are plotting the inverse form of the demand function. Where, this price is written as a function of quantity demanded, why is so? So I will explain everything. So, you see the direct demand function the one we have written Q_d as a function of P is the direct demand function, but we are not working graphically with the direct demand function.

Now, just let me mention that both x or Q are used as very standard notation to denote quantity. So, sometimes we use Q to denote quantity, sometimes we also use x to denote quantity and d superscript stands for demand. So, quantity demanded of good x, x_d is a function of its own price and P is the conventional notation used for referring to price.

So, we are actually not drawing the direct demand function when we are plotting the price which is the independent variable on the vertical axis and the quantity which is the dependent variable on the horizontal axis. What we are doing? We have plotted the inverse form of the demand function, but we definitely need one condition to be satisfied that is g equals to f inverse should exist. If the inverse exists then only we can work with the inverse form of the demand function.

So, we are plotting over here is the inverse of the demand function; Now why it is so? The next question that will arise in your mind.

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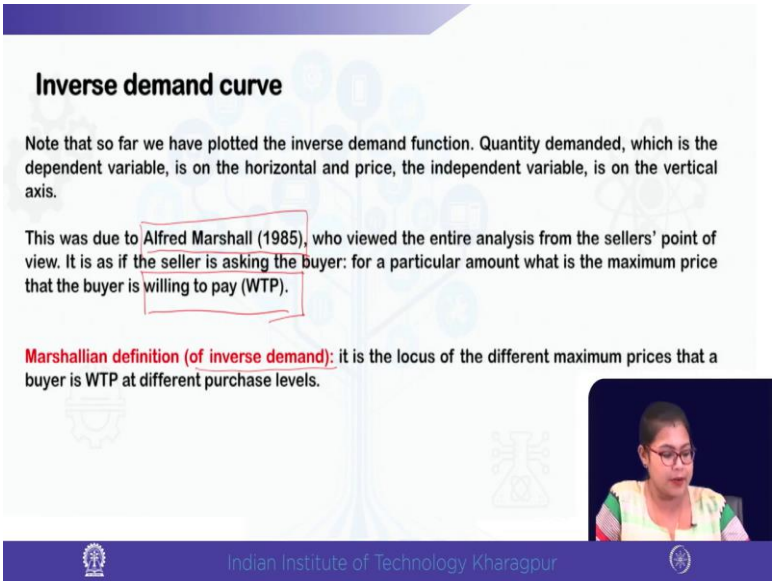

Because, it was due to Alfred Marshall, Marshall viewed the entire demand analysis from the sellers point of view. So, it is as if the seller is asking the buyer how much you would like to pay if you want to buy a particular quantity suppose x_0. And the buyer answers to buy x_0 I would like to pay the price p_0; that means, the price p_0 is a function of the quantity x_0 right.

So, it is as if the price that the buyer is willing to pay becomes a function of the quantity that the buyer wants to buy. Now, suppose the seller is again asking the buyer; if the seller is asking the buyer, if you want to buy a higher amount say x_1 how much would you like to pay? Now, suppose the buyer answers that to buy a larger amount x_1; so, see from our own behaviour we know if we want to buy more what do you want? We want the price to be less.

So, the buyer tells that if I have to buy a larger quantity x_1, I would like to pay a lower price P_1; so, this is the maximum willingness to pay a price. So, what we see is that corresponding to each quantity demanded, the buyer has a maximum willingness to pay a price. So, if the buyer wants to buy x_0 that the maximum price he or she wants to pay is p_0 if the buyer wants to buy x_1, the maximum price he or she wants to pay is p_1.

So, in a sense the maximum price that the buyer is willing to pay it becomes a function of the quantity that he or she wants to consume. So, this is why we are not working with the direct demand function, we are not drawing the direct demand function. So, if someone draws price on the horizontal axis and quantity on the vertical axis that is wrong.

So, we follow the convention which is we plot the inverse form of the demand function, but only we need one condition to be satisfied that g equals to f inverse should exist. So, the inverse demand curve is entirely from the seller point of view. So, just for a recapitulation; so, it was by Alfred Marshall who viewed the analysis from the seller's point of view.

So, as if the seller is asking the buyer, it is not the actual case, but as if the seller is saying to the buyer that if you want to buy a particular amount what is the maximum price that one is willing to pay. Now, see that can be different from the actual market price, this maximum willingness to pay a price is not the actual market price.

As I was mentioning the actual market price will be determined from the interaction of the market demand and market supply. But this is different from the willingness to pay the maximum willingness to pay price. For each quantity we are buying often we have a maximum willingness to pay price. Suppose one day someone does not have the time to have breakfast; so, if one skips a breakfast that person will be very hungry during the lunch time and would like to pay a very high price for the lunch meal.

But, if on other day a person has a good breakfast that person may not be that hungry and may not be willing to pay the same high price for a lunch meal that he wanted to he or she wanted to pay on the day before. So, for each quantity we plan to purchase; so, this is only the plan remember that these are not the actual quantities transacted just what we are plotting this x_0, x_1 these are not the actual quantities transacted. These are the plans of the consumer; so, if I plan to buy this amount what is the maximum price that I plan to pay.

So, basically the demand curve of the consumer represents the purchase plan of the consumer ok. So, the maximum willingness to pay price is the maximum price that a buyer is willing to pay to buy a particular amount, this is sometimes also referred to as the buyer's price or the buyers reservation price ok. So, this entire analysis was due to

Alfred Marshall; so, we should remember that we are plotting the inverse form of the demand function.

Because we will be often coming across the demand and supply curve; so, we should have very clear idea of demand and supply functions and the plot of the functions are called the demand curve or the demand schedule; so, that is the purchase plan of the consumer. So, by the Marshallian definition or from the point of view of the inverse demand function how do we define the demand schedule or the demand curve?

So, the demand curve is the locus of different maximum prices that the buyer is willing to pay for different levels of purchases. So, what was the direct demand function definition? So, that is the locus of different quantity of a good that the buyer is willing to buy for different prices. And the Marshallian definition or the definition of the inverse form is the locus of the different maximum prices that the buyer is willing to pay at different levels of purchases.

Now, here I would like to point out one frequent confusion by the students or the learners who are studying economics for the very first time. Many I have found from my experience that get confused with the concept of law of demand means the inverse demand function. So, many refer to the inverse demand function as the negative relationship between price and quantity demanded no, it is not that.

The negative relationship between price and quantity demanded is nothing but the law of demand ok; so, what we empirically see is that as price falls, quantity demanded increases. So, price and quantity demanded are negatively related, that is not the inverse demand function that is law of demand. And what is the inverse demand function? Because of the name inverse demand function many interpret that inverse demand function is the inverse relationship between price and quantity demanded.

But that is wrong ok, means inverse relationship between price and quantity demanded is law of demand. And what is the inverse demand function? The inverse demand function is the situation where the demand price becomes a function of the quantity that the consumer wants to buy. So, this is basically the Marshallian demand function; where the maximum willingness to pay a price, see this p_d, what is this p_d? p_d refers to the demand price or just now I define the maximum willingness to pay a price.

So, the inverse demand function refers to the maximum willingness to pay price, it becomes a function of quantity demanded and the direct demand function is x_d as a function of p. So, whatever be the subject I means paper particular paper or course in economics, everywhere in economics always we plot price on the vertical axis and quantity on the horizontal axis. So, we will also see as you proceed we will discuss the supply side.

So, even in supply side also price will be always plotted on the vertical axis and the quantity on the horizontal axis, and then we will be when we will be getting the equilibrium for the market. So, what is the equilibrium price and what is the quantity transacted then also we will be plotting the demand supply together. So, price will be on the vertical axis and the quantity will be on the horizontal axis.

So, we should be very careful about this confusion between inverse demand function and the negative relationship between price and quantity demanded that is the law of demand. So, inverse demand function just let me just reiterate once again is p_d as a function of x, demand price as a function of quantity demanded and negative relationship between price and quantity demanded is law of demand.

Now, there are some exceptions to the law of demand for example, there are examples of Giffen good where even if price increases, quantity demanded will not fall, but quantity demanded will increase or if price falls, quantity demanded falls. So, there are examples of poor quality food grain which come under Giffen good, but once again the empirical validity of Giffen good is also subject to lot of debates.

Another example of violation of law of demand is where say for branded products; even if price increases, quantity demanded increases. So, that is often referred to as the Veblen effect, it is also sometimes I mentioned as snob apple. Those who are buying the branded say famous designers garment, they just own take pride in owning that garment. If price falls; so, the pride will no longer be there; therefore, these are some of the examples of violation of law of demand.

So, when law of demand is violated, the demand curve will be upward rising, but we are not going into those details. So, just we stick to the law of demand which is mostly seen, because violation of law of demand is empirically very rare. Mostly we find that for most

of the goods and services that we consume, the law of demand holds; that means, as price increases quantity demanded falls.

So, from the inverse point of view as the consumer maximum willingness to pay price will fall, if the consumer wants to buy more. So, once again you see by law of demand as long as law of demand is there; so, as long as the law of demand is holding the sign of the first derivative the f prime; that means, $\partial x / \partial p$ will be what it will be negative.

Similarly, in the inverse demand function also with law of demand holding, because the price and quantity they are negatively related; so, g prime will be negative. So, we will be mostly considering the cases when law of demand holds, but when we are working with the graphical representation. Then we are working with the inverse form of the demand function in which we are plotting price on the vertical axis and quantity on the horizontal axis.

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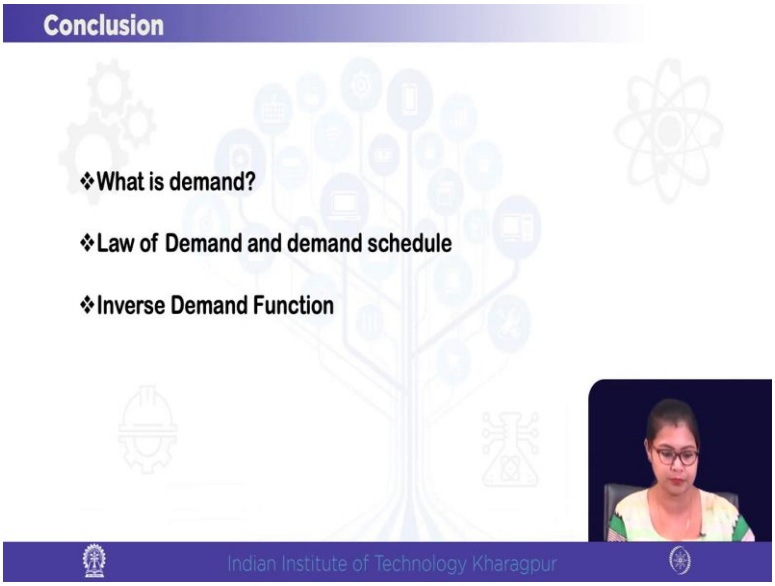

So, in today's class we introduced very important concept of demand and what we defined is that, demand is not merely the wish or want. In economics demand must be backed by purchasing power, if the consumer is willing and able to buy a particular good or service at a specific period of time then that only constitute the demand of the consumer. And we are working with the representative consumer for the time being.

Then we also discussed how quantity demanded depends on its own price. So, we saw that most of the cases quantity demanded varies inversely with its own price, as price increases quantity demanded falls and this is called the law of demand. And when we plot the relationship between price and quantity demanded, we get what we call the demand function, demand curve or the demand schedule.

However, we just saw that we plot the inverse form of the demand function which was due to Alfred Marshall. Because what we are plotting is? We are plotting the inverse form in which demand price or the maximum price that the buyer is willing to pay becomes a function of the quantity that the buyer wants to buy.

Therefore, in the graphical representation we are not working with the direct demand function, but we are working with the inverse form of the demand function. And we will be of course, considering that law of demand holds in our subsequent analysis.

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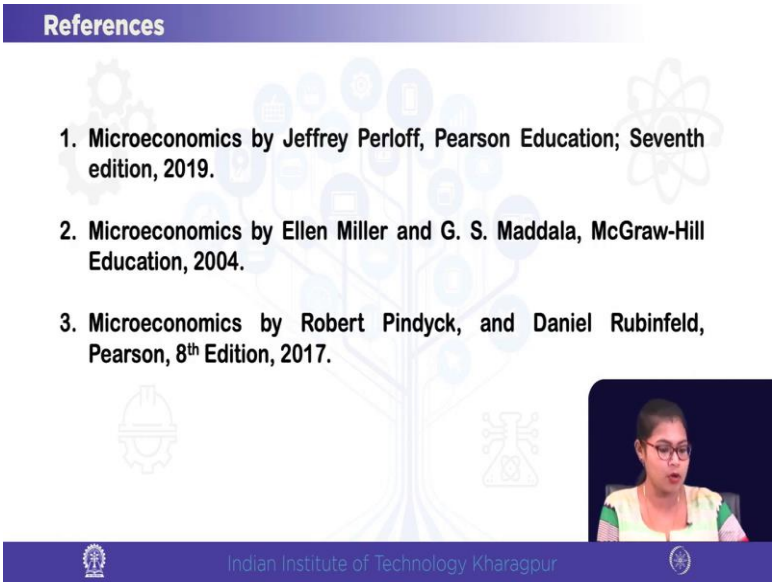

So, we can follow any standard microeconomics book for this part, but I mainly refer to these three books, but one can follow any other standard microeconomics book. Therefore, in the subsequent lectures we will be discussing about what are the other factors on which quantity demanded depends and what will happen if this own price and other factors change.

And by how much quantity demanded changes when own price and other factors change; that means, the concept of elasticity; so, these topics will be covered in the subsequent lectures.

So, thank you see you in the next class.