Modelling and Analytics for Supply Chain Management
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Lecture 33
Periodic Review System

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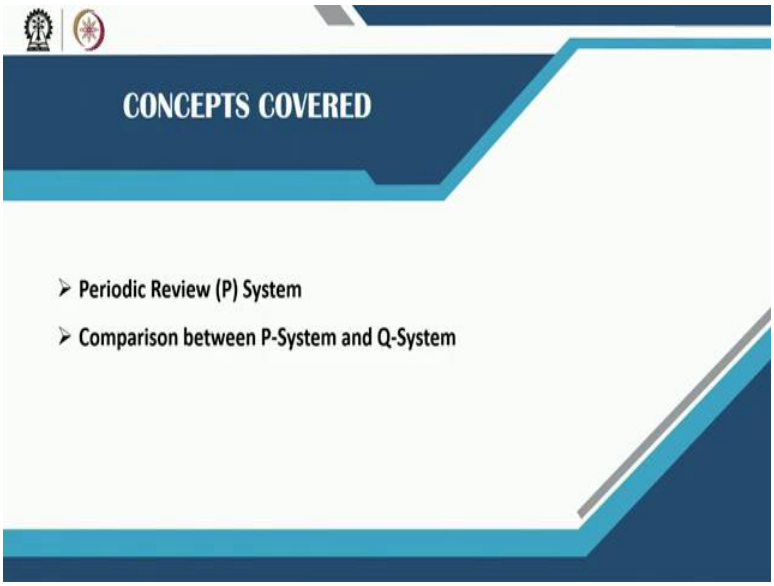

Hello, welcome to our session on Periodic Review System related to Inventory Modelling. In this session, we will be covering concepts related to Periodic Review System and at the end we will be discussing comparison between P System and Q System, Q-System we have discussed in the last module and in this particular module will be discussing about P-System and then finally will draw this comparison.

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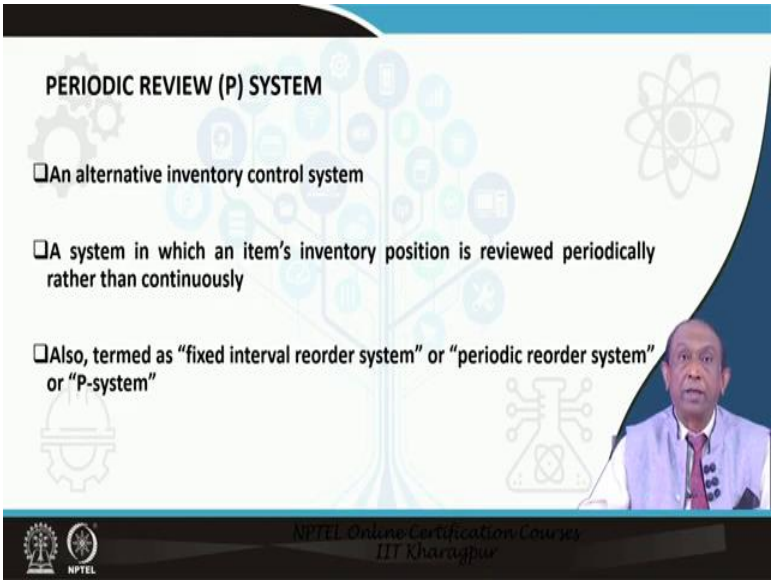

Periodic Review System is an alternative inventory control system where in it is a system in which an items inventory position is reviewed periodically rather than continuously. Inventory position in the last module we had discussed is basically, the On-handed inventory plus the schedule receipts minus the back order.

Periodic review system, which is basically the P-System is also termed as Fixed interval reorder system or Periodic reorder system or P-system here, the review period is fixed but the order size can vary. In this periodic review based inventory control system, inventory position is reviewed at predetermined fixed points in time therefore, these systems are known as Fixed order interval system. If, the first status review happens at time P, the second review would be carried out at a point 2P, and so on.

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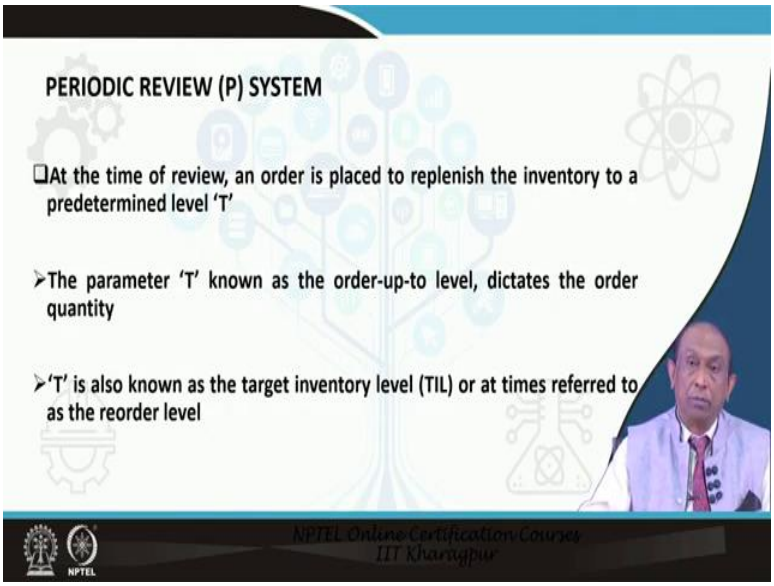

At the time of review, an order is placed an order size is such that, it will replenish the inventory position to a predetermined level which we denote by T, this parameter T is also known as order-up-to level and this order-up-to level basically dictates the order quantity which is variable order quantity, this T is also known as target inventory level and at times referred to as the reorder level in a periodic inventory system.

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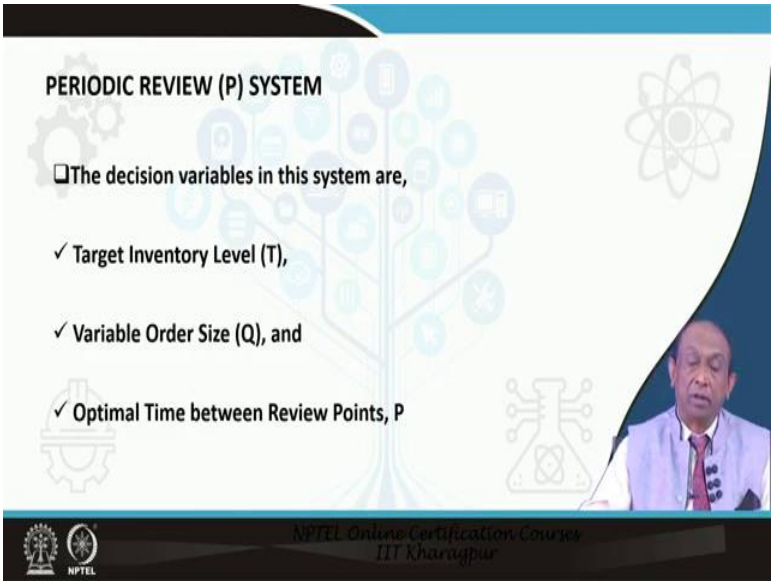

So, the decision variables in this system are that target stock level or target inventory level T, the variable order size Q and the optimal time between the review points that is P that means the review period. So, we have to determine 3 things T, Q and P.

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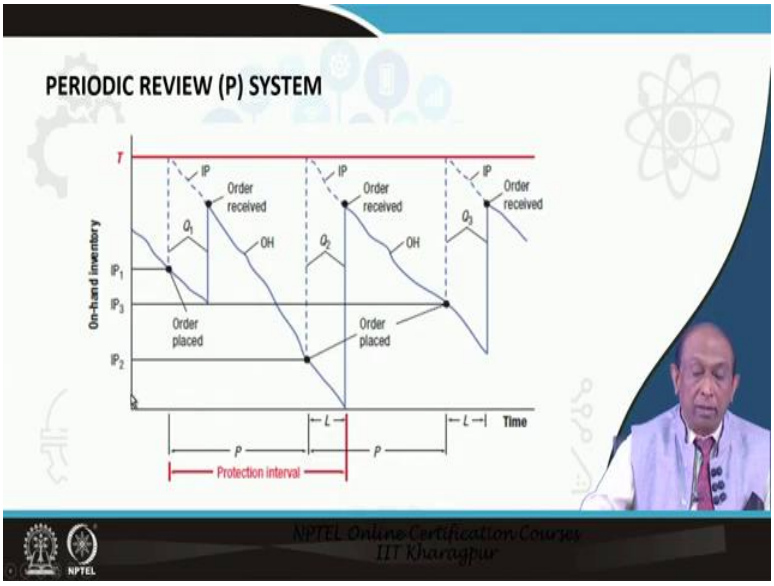

Let us, understand this system again as before we denote the stock level may be on an inventory or the inventory position along the y-axis and x-axis denotes the time. The target inventory level T is being denoted by these red line. The stock level is denoted by these blue lines one-hand inventory. When these on-hand inventory depletes and falls down to this particular position say and that was the beginning of a or that was a point when that stock was reviewed and order size equivalent to that difference between the

target stock level and the inventory position IP1 that is target stock level minus the inventory position IP1 this amount was placed as an order on to the supply which is Q1 and we planned it in such a way that the inventory position will be up to the target stock level then depletion takes place and the order finally arise at this point.

So, this is order received, again there is depletion of stock consumption takes place from this point in time when the first or inventory position was reviewed and then order was placed a time period of P has elapsed when we review the position of inventory and we find that it is IP2 at that point in time we place another order which is the difference between again the target stock level which is fixed and IP2. So, target stock level T minus IP2 is the amount Q2 which is placed as an order on to the suppler at this point in time.

So, order placed, but we do not immediately get the replenishment, the replenishment comes at a point in time which is in here, which is after a lead time period L the order is received again the stock fluctuates this is on-hand inventory and again at the review period we placed an order amounting to Q3 which is nothing but the difference between the target stock level and the inventory position IP3 and this cycle continue. So, one thing to note here you see that this Q1, Q2 and Q3 are not same that means the order quantities they vary at each review so, variable order size but, the review period is fixed.

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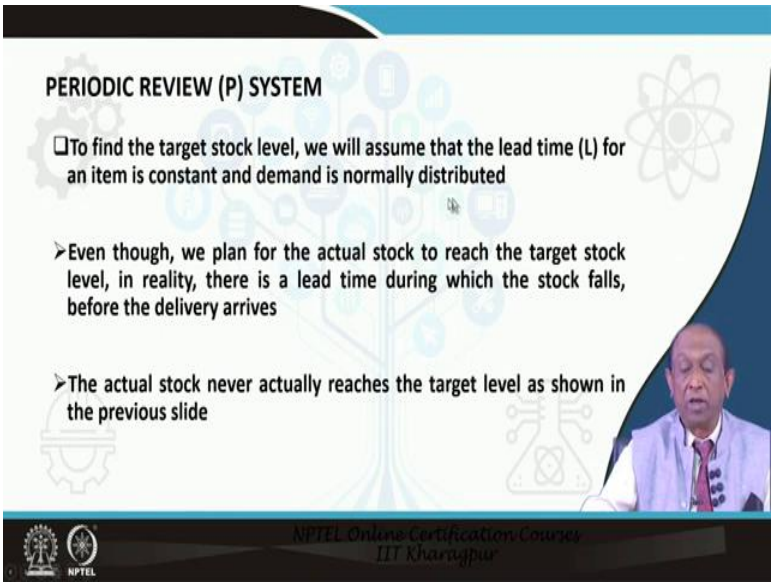

So, the first decision variable is to determine the target stock level. To find the target stock level, we will assume that the lead time for an item is constant and demand is normally distributed, that assumption will hold good, one thing you must notated that even though, whenever we place an order we plan in such a way that the actual stock level should reach the target stock level but, in reality there is a lead time during

which the stock falls because, consumption takes places during that lead time period before the delivery arrives.

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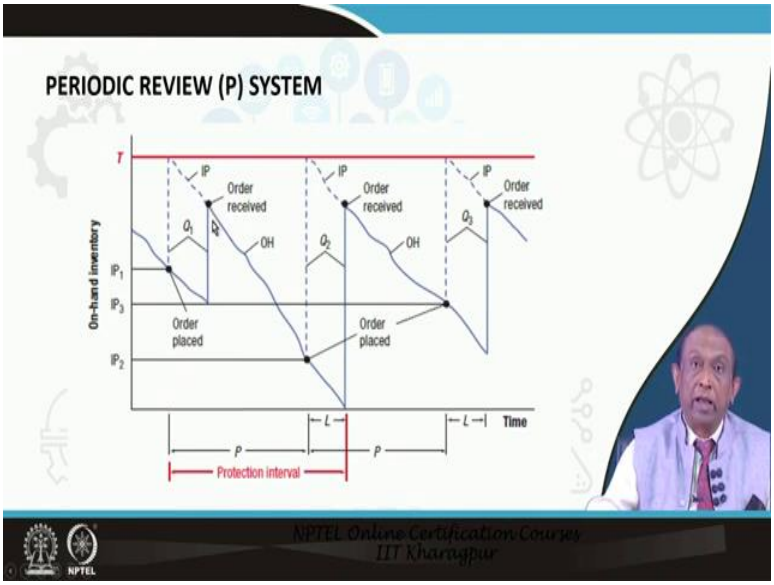

So, if you refer to that figure here you will see that even after receipt of an order the actual stock level never reaches the target stock level.

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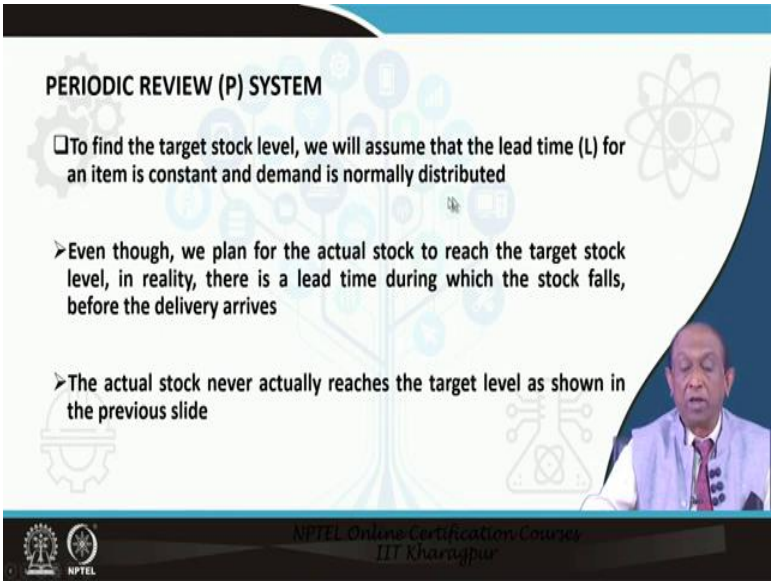

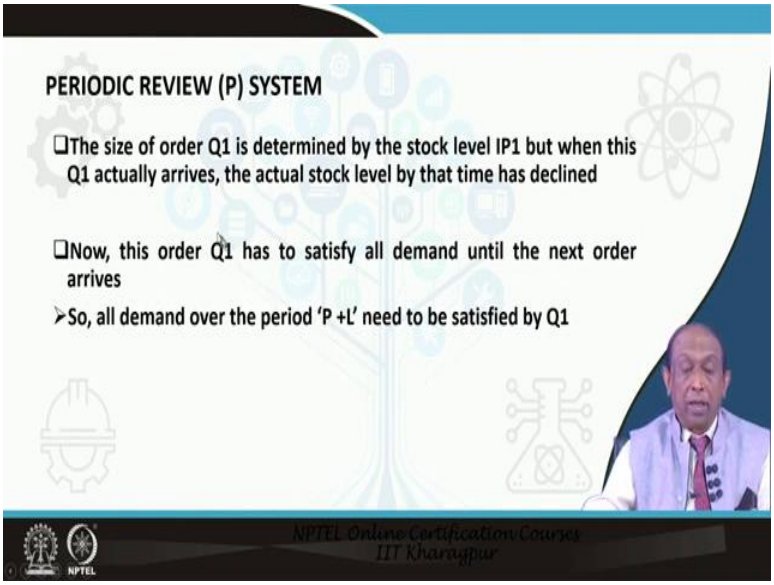

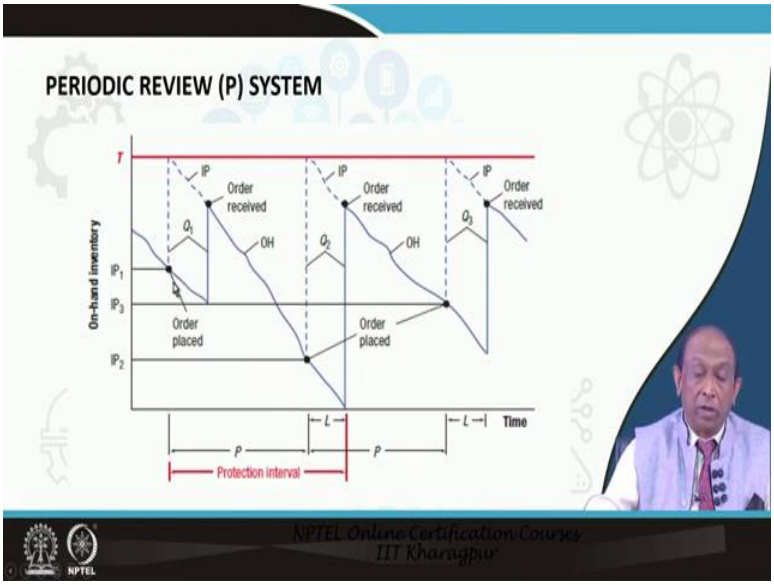

The actual stock never actually reaches the target level, the size of order Q1 is determined by the stock level IP1 but, when this Q1 actually arrives, the actual stock level by that time has declined. Now, this order Q1 has to satisfy all demand until the next order arrives. So, all demand over the period P plus L need to be satisfied by Q1, you see this order size Q1 you are receiving this order here but, the next order is received at this point in time. So, this order size Q1 must satisfy all the demand over the period P plus L which is basically called the Protection interval because, still that point in time you are not getting any fresh order received.

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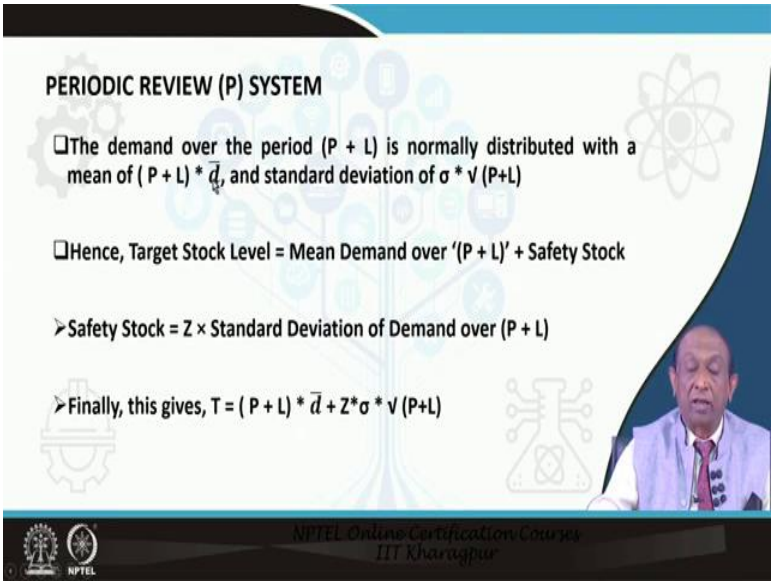

So, the demand over the period P plus L, P means the review period plus L which is the lead time has been assume to be normally distributed with a mean of P plus L star d bar and standard deviation of sigma into root of R of P plus L, sigma d basically into root of R of P plus L. So, the target stock level is a mean demand over P plus L plus the safety stock and as discussed before the safety stock is nothing but Z multiplied by the standard deviation of demand over P plus L, where Z is a standardize normal random variant. So, finally we get the expression for the target stock level T which is nothing but, P plus L star d bar plus Z star sigma star root of R of P plus L, where sigma denotes the standard deviation of demand.

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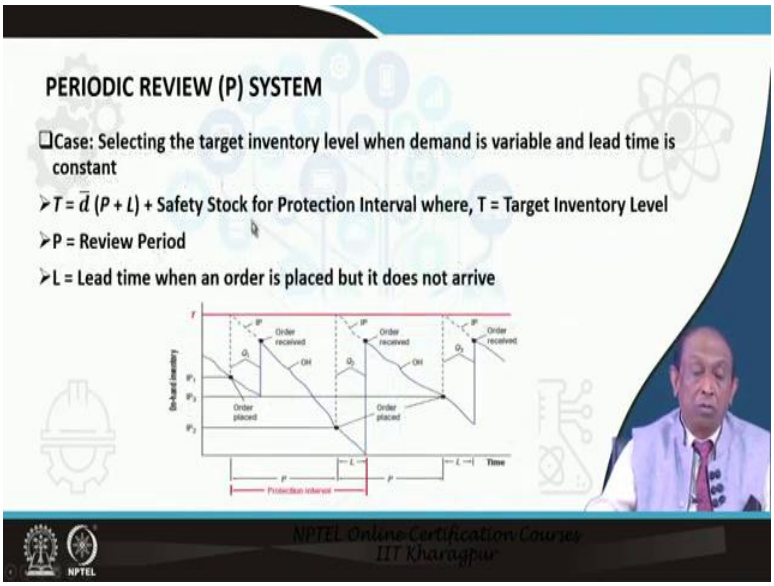

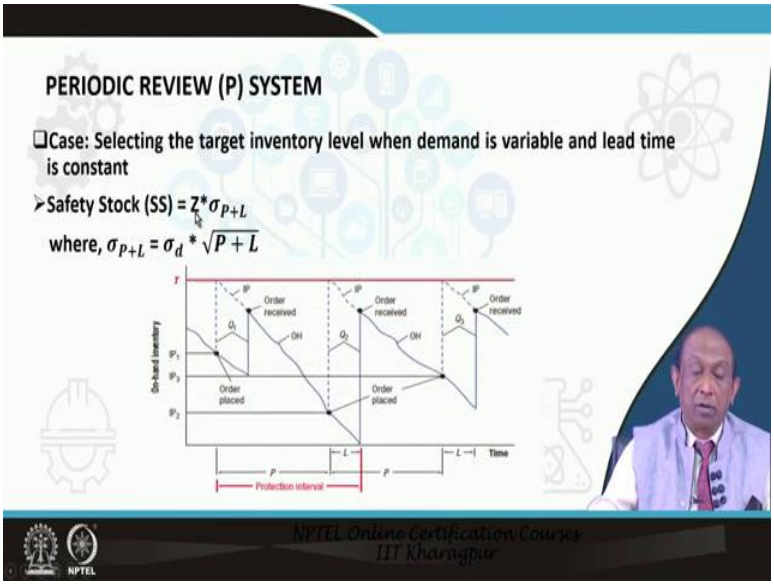

So, we first discuss this case when target inventory level has to be determined under a situation when demand is variable and lead time is constant as before target stock level T is d bar into P plus L where d bar is the average demand plus safety stock over the protection interval, T is a target inventory level, P is the review period, L is the lead time when an order is placed but it does not arrive instantaneously.

So, safety stock under such a circumstance becomes Z times the distribution of demand over a period P plus L where, this sigma P plus L like we discussed before is sigma d star or times root over of R of P plus L.

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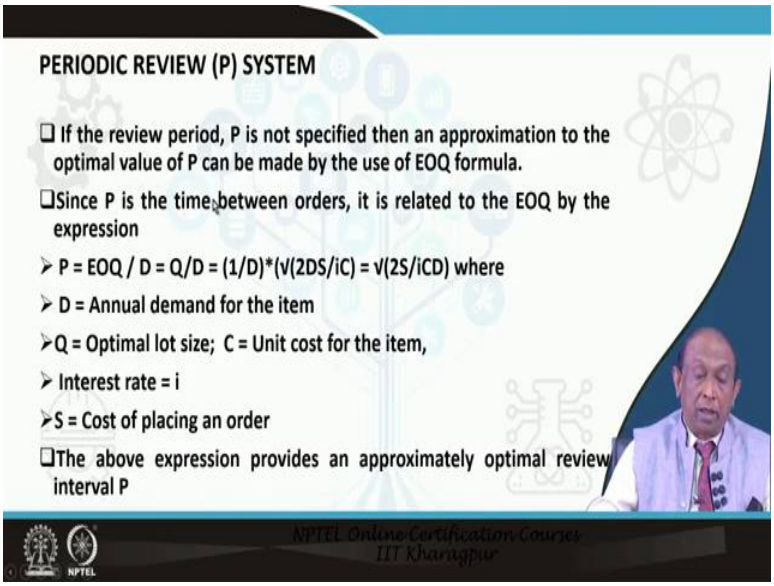

Another important thing to be notated is that if, the review period P is not specified than an approximation to the optimal value of P can be made by the use of Economic Order Quantity formula. Since, P is the time between orders, it is related to the economic order quantity by an expression which is P is equal to economic order quantity divided by the annual demand D which is nothing but Q by D.

Which is nothing but 1 by D multiplied by the formula for economic order quantity which is root of R up to 2DS by i into C where, D is annual demand, S is the cost of placing an order, i is the interest rate, C is the unit cost of the item. This particular expression then gives you an approximately optimal review interval P you will use this particular value of P in a problem where the review period is not given and you have to determine that.

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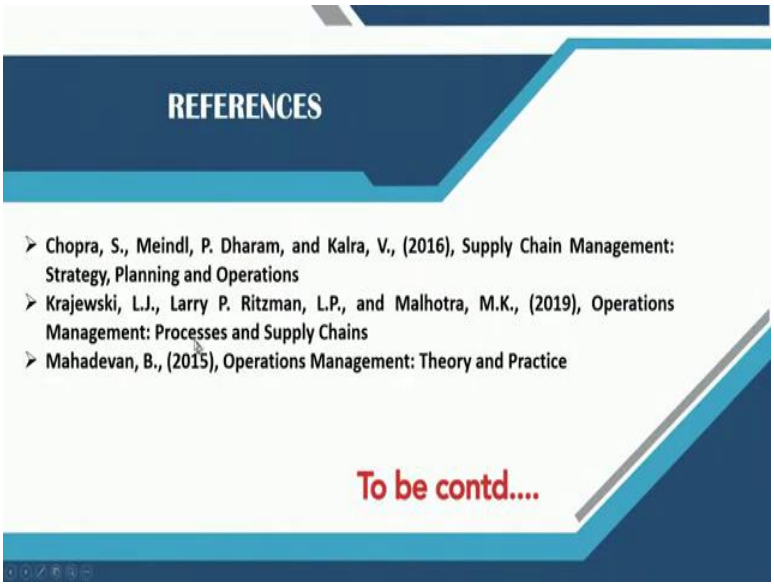

Thank you. These are the references for this particular session. Thank you all.