Principles of Industrial Engineering
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Lecture 04
Tool of IE and Organizational Structure

Hello, I welcome you all in this presentation related to the subject Principles of industrial engineering. And so far we have talked about the various introductional aspects of the Industrial Engineering. In this presentation I will talk about the two aspects; one is like the various tools and techniques available with the industrial engineering which can be used for optimum utilization of the resources, reducing the wastage and increasing the productivity, reducing the cost of the goods and services which are being produced.

And apart from the tools available in the industrial engineering, we will also see the organizational structure, what is organizational structure and how these are designed what is the purpose behind this.

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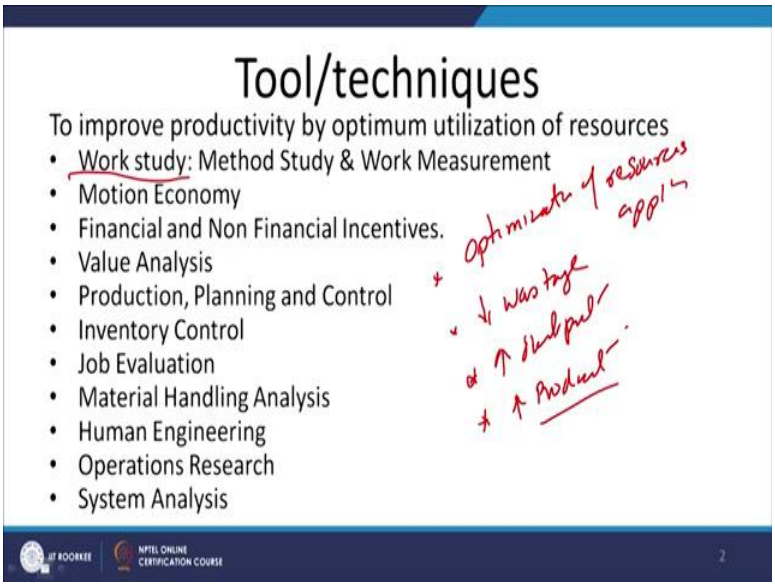

So, starting with the tools of the Industrial Engineering, we have a range of the tools which are available in the industrial engineering, which are used primarily for optimization of the resource applications, so that the wastage is reduced and the output in a given situation is increased, and these in turn help in increasing the productivity, this is what in general is realized through these tools. So, if we see the first one is here, although there is no sequence, but these are the various tools which are available.

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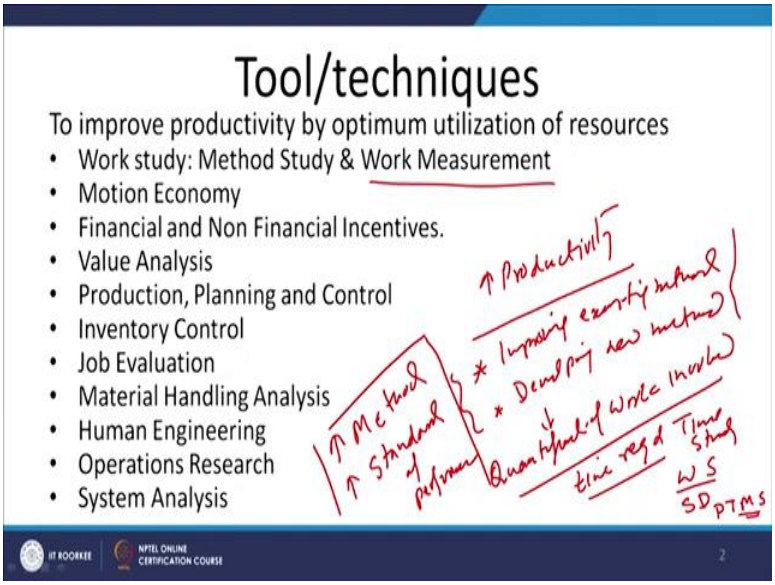

Starting with the work study, what we have work case study is a tool available in industrial engineering which helps in basically increasing the productivity. And for increasing the productivity it uses the two approaches; one is called method study, which helps in improving the existing method of doing the job or developing the new method. Idea behind this is that all the non-productive elements are eliminated and the job is done in most efficient manner in the minimum possible time.

So, basically efforts are there in cutting down the time by improving the existing method or developing the new method. Another technique associated with the work study is the work measurement. In the work measurement, the quantification of the work, quantification of the work involved in a, doing a particular job is done and which is primarily done in terms of the time required to complete a job.

And for these various techniques like the time is study, work sampling, standard data method and predetermined time motion study method. So, these are the four methods which are used. So improving the method of the doing a job is one, method improvement is one aspect and quantification of the work associated with the job helps in setting the standard of performance, which can be used in a number of ways, for setting the wage and incentive plans or assessment of the capacity of the organization and likewise identifying the venues where the improvement is needed, so that the productivity can be enhanced.

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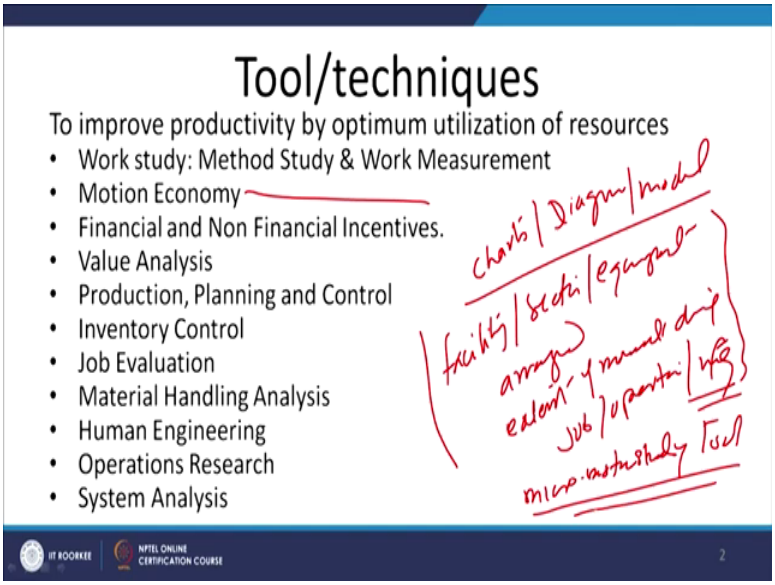

Another tool is the motion economy. In case of the motion economic like various charts, diagrams and models are used to see the way by which the facilities, sections, or equipment should be arranged. They are arranged in such a way that the extent of the movement, extent of the movement during the job or operation or manufacturing all that is reduced, not only the largest scale movement, but the micro motion study kind of things help in optimizing the way by which the body parts are used to do a job.

And in that case, the micro motion study kind of the tool is used, which helps in investigating and studying the actions of the different body parts during the job and identifying if there are non-productive elements present in the existing method of doing the job and then what kind of the improvement can be realized after micro motion is study of the short time jobs, so that the efforts to do the same job can be reduced and the time to complete the job is also reduced.

So, basically the motion study involves the study. The target is to avoid the unnecessary movements of the man, material and the machines as per the case and also to optimize the efforts being given by the operators, workers, manually during the short time jobs through the micro motion study kind of the tools.

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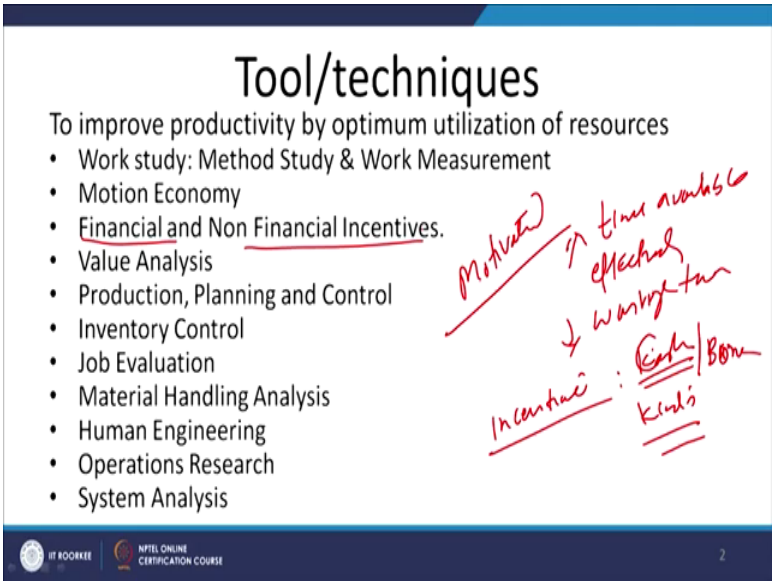

Then, there is a financial and non-financial incentives, idea here is to see that how the manpower which is there is motivated so that the time available with the workers is effectively used and the wastage of the time is reduced. So, effective time is increased and the wastage of the time is reduced. If the workers are motivated and so for the motivation purpose we need to see how they can be provided with the suitable incentives. These can be given in form of like cash or the bonus plans or these can be given in form of the kind, so that is what is there in financial and non-financial institutes, incentives.

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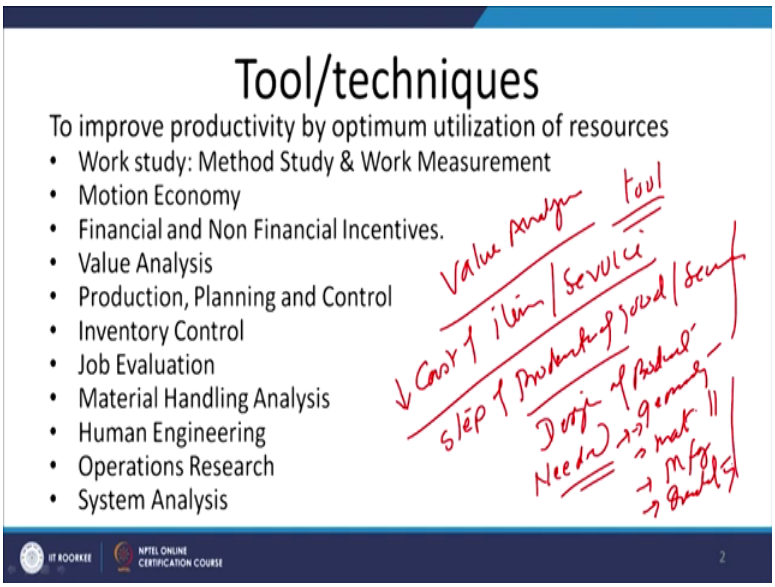

Then we have the value analysis. This is the kind of a tool or technique which is available in the industrial engineering with the goal of reducing the cost of the item being produced or the

cost of the service or the cost at which service is being provided. In this approach, each step of production, of goods and service, not just production, but the design of the product is challenged to see if it is a really needed or not.

So, every step related with the production or every aspect related with the design is challenged to see the real need of that particular aspect, whether it is the geometry is really needed for proper functioning, the kind of material which is being used is really right type or there is a possibility of the improvement if it is being manufactured using the kind of correct kind of procedures, proper quality control is being realized or not.

So, every step related with the design or production of a product or service is challenged to see if we are using the correct kind of thing or these are the optimum ones, if not then what can be done in order to improve the quality of product while reducing the cost of the item which is being produced.

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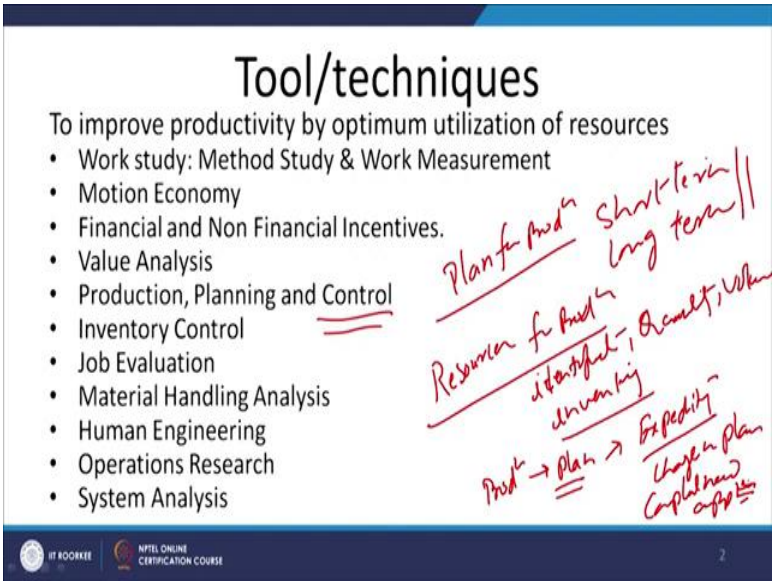

So, here the focus is on reducing the cost of the item or the cost of the service by working on various design and production aspects related with a particular product or service, then we have the production planning and control. So, under the production planning control plan for production either short term or long term plan is developed.

So that accordingly the resources needed for resources for production can be arranged. So, whatever the steps are related with that like identification, identification of the items, their quantity or the volume which is to be purchased and like the kind of the inventory that is to be maintained so all that will be the part of the production, planning and control.

And control is needed to see if really the production is going on as per plan or not, or if there is any expediting is needed, like expediting or the change in the plan is needed or complete new approach is required to, approach is required to realize the set goal or the target.

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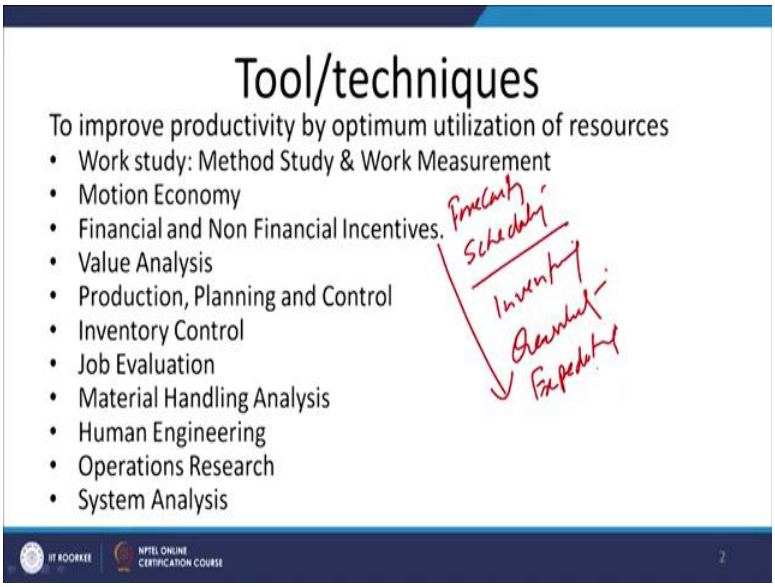

So, they are like the things it involves like scheduling inventory, also includes forecasting, scheduling inventory, quality control, and various things which are needed, expediting other things so that we can review the situation at any moment of the time to see if the things are going as per plan or some kind of the changes needed.

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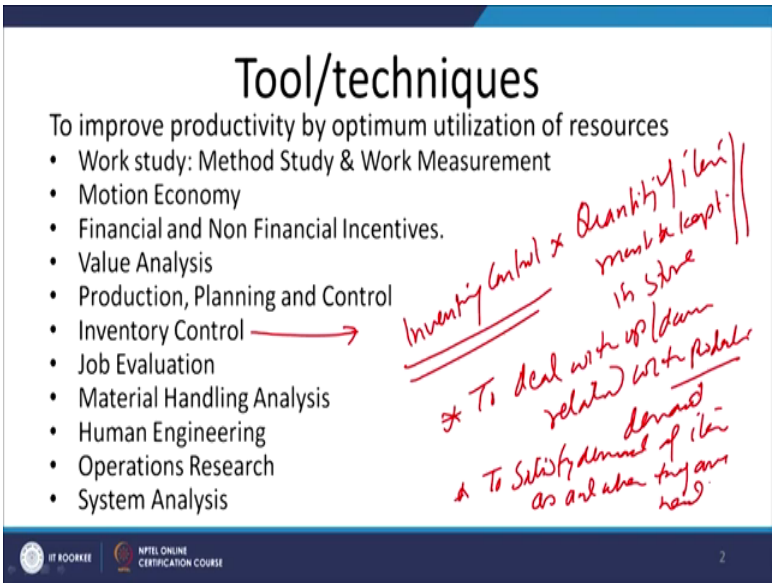

They have said inventory control. It is a kind of the approach where which is primarily applied to see what quantity of the items must be kept in a store, whatever items we need for having the smooth production of the goods and services, those items are available in sufficient quantity for a sufficient period, so that the production can continue without any barrier or hindrance. So, what is that quantity which should be kept in a store?

They have two reasons for that for maintaining the inventory. One is to deal to deal with the ups and downs related with the production or demand if it is retail or the second important point is to make the things available as and when they are needed, we need to maintain the inventory. It is possible that we may order today and after two hours we may get the item but sometimes it does not happen.

So, to deal with the situation of the possibility of delay in delivery, inventory is maintained to see that items are available whenever they are needed, because it becomes sometimes impossible to get the items from the market directly when they are needed. So, to satisfy the demand of items as and when they are needed. So, the these are the two things, it deals with the ups and downs related with the production or the demand of the item or it helps to satisfy the demand of the item as an when it is needed. So, these are two aspects.

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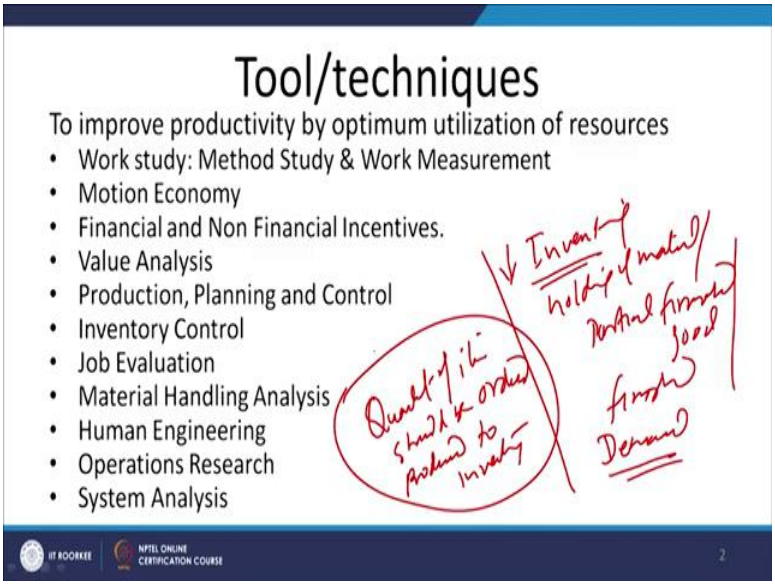

Efforts are always maintained to have the minimum possible inventory while satisfying that demands related with the items which are required for a smooth production because the inventory is just about the holding of the material partially finished goods or finished goods.

Or inventory is also kept in the store, if it is if the company is involved directly in trading then they will be keeping the item in the store to satisfy the demand directly of the customers.

There are various kind of various approaches which are used to find out what quantity of the item should be ordered or produced for inventory, and this quantity must be optimized in order to avoid unnecessary investment and storage of the material in the stores, because it simply leads to the holding of the capital or the, the money in inventory. So, efforts are always made to minimize the inventory while satisfying the demands which are there.

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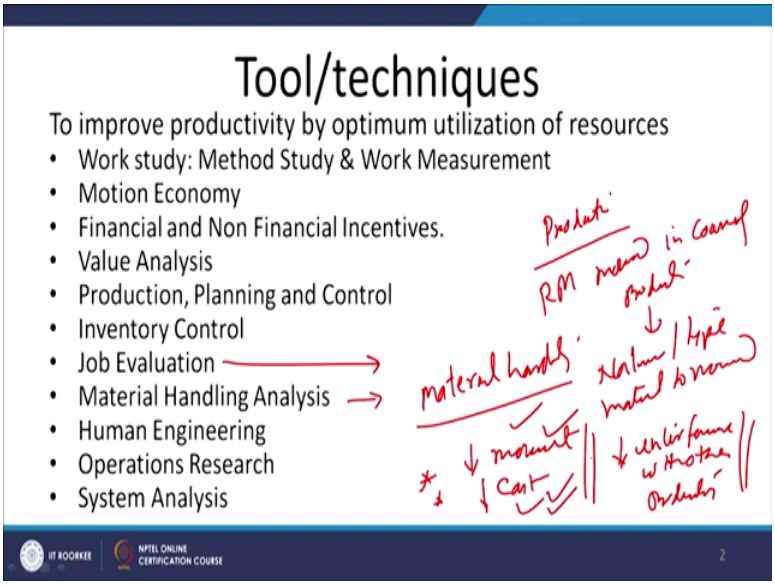

Job evaluation is about the kind of various aspects of the job which are the barriers, barriers relative to the particular job, what are the factors where improvement is needed and what are the things which can be extracted from the job conditions with regard to the wages and incentive plans?

Then material handling, material handling is very important aspect related with the production because the either the raw material has to be moved in course of production. So, as per the as per the nature or the type of the material to be moved during the production, the various methods are used and efforts are here made to see that the extent of movement whatever is needed during the production of the goods and services, that movement is minimum.

So, the facilities are arranged in such a way or the material handling devices are used in such a way that the extent of the movement is reduced and the cost occurring due to the movement or the efforts needed for facilitating such kind of the movements and leading to the various

costs that is also reduced. So, the movement is reduced and cost is also reduced and that it should be done in such a way that it causes the minimum interference with the other production activities going on in the organization.

So, material handling channels should be such that such that they do not interfere with other activities, cost is minimum and the extent of the movement which is needed is also minimum, because sometimes if the arrangement of the equipments and the machines is very clumsy, then there can be very criss-cross kind of the movement and which will require unnecessary extra movement and so the extra cost related with the material handling.

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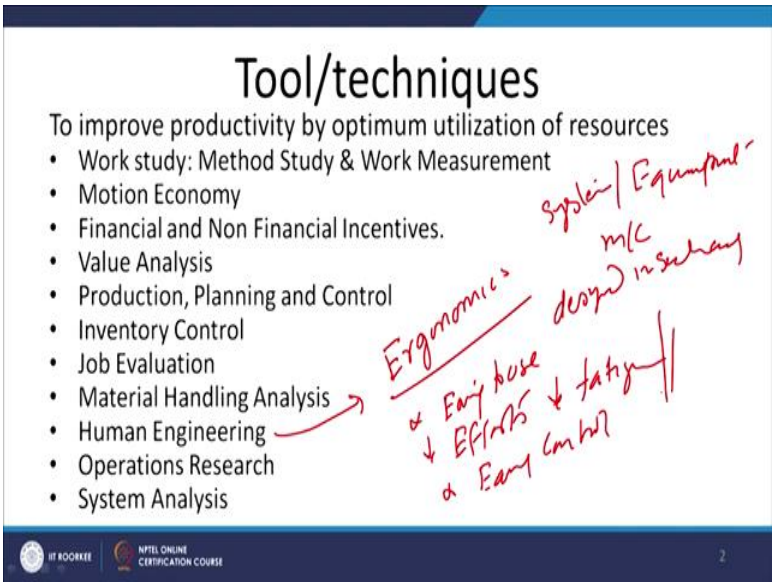

Then we have the human engineering, this is also called ergonomics. In human engineering basically the systems, equipment, machines are designed in such a way that the efforts required to use those machines by the workers and the manpower that is minimum, so easy to use, less efforts, less fatigue, easy control. So, this is one aspect which is applied on the equipments and the system being used by the workers in course of the production.

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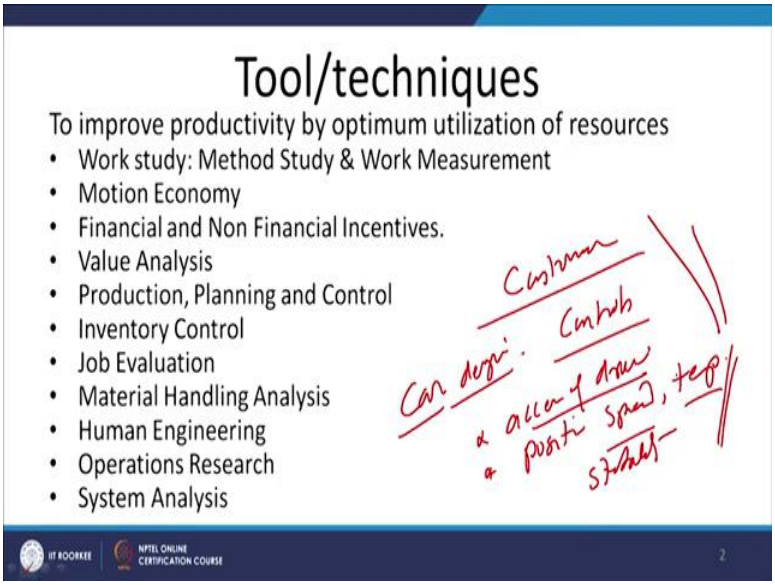

Ergonomics is also applied in in all those equipment and systems which are to be used by the customers. For example, if there is a car design, so in car design different controls will be arranged in such a way that they are in the easy access of the driver and he is able to see that the position of the various things like the kind of speed or the kind of the temperature of engine and the kind of the rotational speeds, speed, temperature and the stability of the vehicle.

So, these things, not just good access of the control, but whatever displays are there, they provide the required information with ease. So, these need to be designed in such a way that the customers and the workers, customers are able to use the equipment or the vehicles effectively.

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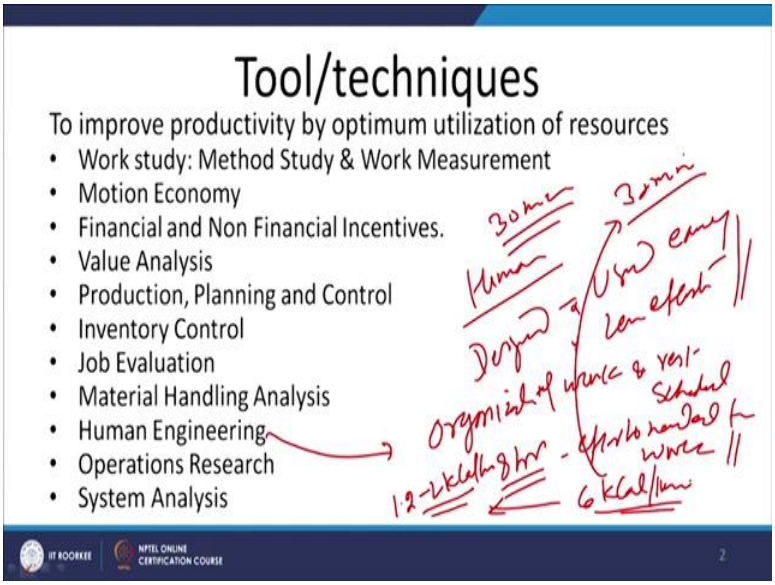

So anything which is to be used by the human being needs to be designed in such a way that it is used easily with the less efforts, easy to use, we can say user friendly, and it requires less efforts. These are the important things to popularize the achievements and to make the movements which are more user friendly.

Another important aspect related with the human engineering is the organization of work and rest schedules like in a shift of 8 hours as per the efforts needed for work by worker after which time of the work rest should be given depending upon the kind of energy consumption during the work, if the energy consumption is really high, it may be required like energy consumption is like say 6 kilo calorie per minute in doing a, during the work that it will be possible that the break is needed just after 30 minute, so that the worker can recover from the fatigue being caused during the work.

And if the energy consumption rate is very less like in sitting posture, sitting position if the work is primarily involves just sitting consuming the energy like 1.2 to 2 kilo calorie per minute, then due to the physical effort no break may be needed and the break is given just to satisfy their physical needs or like mandatory 30 minute break in a shift of 8 hours to satisfy the personal physical needs. So, the organization of the work and rest schedule is also part of the human engineering.

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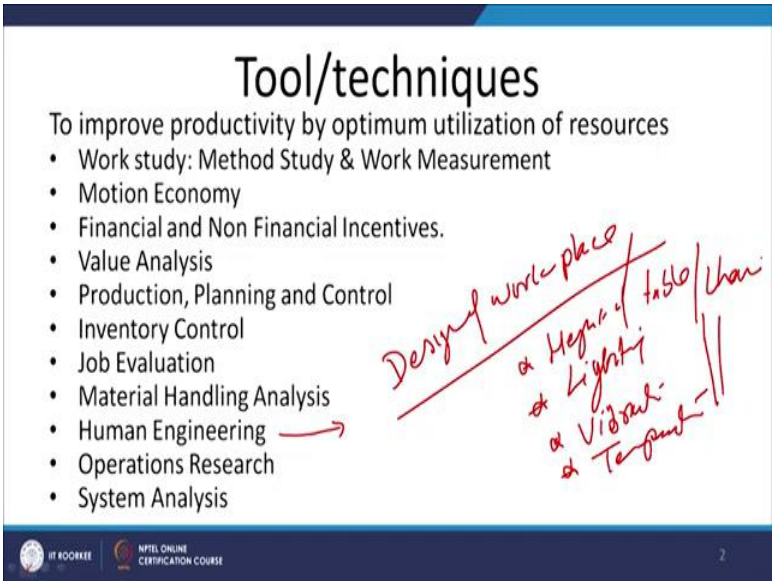

Another aspect that we look into the human engineering is the design of workplace like what should be the height of the table? What table, what should the height of the chair, how the, what kind of the lighting should be provided during the work as per the kind of the size of the equipment to be handled.

The kind of the vibrations which are being experienced during the operation, or the kind of the temperature which is needed for smooth and the fatigue free work environment. So, effort, efforts are made to provide the comfortable work environment to the workers so that they can work in a very motivated way with the full efforts to contribute maximum to for realizing the goal of the organization.

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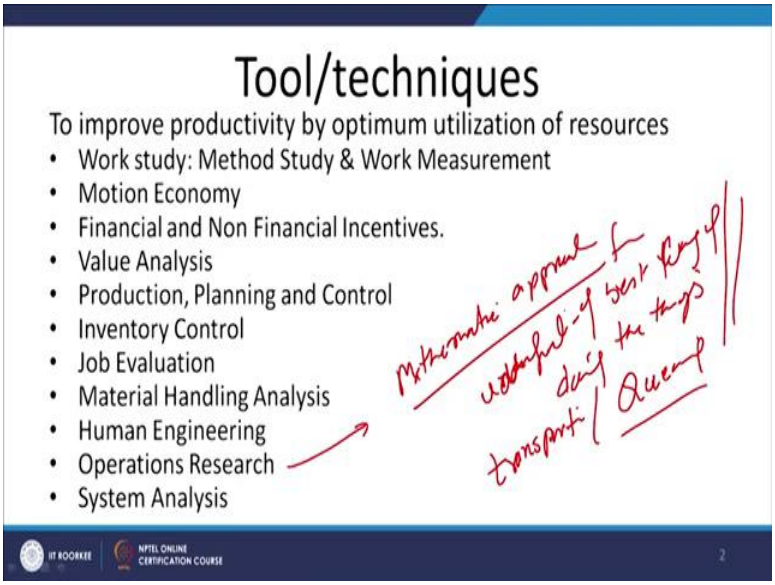

Then we have the operation research. So, the this is a kind of the mathematical approach for identification, identification of the best way of doing the things and it is commonly used in the logistics, say to handle the transportation related problems or to in queuing aspects like in which way the job should be handled in sequence so that the waiting is minimum and the utilization of the resources is maximum. So, basically the mathematical approach to see what should be done in order to increase the utilization to reduce the wastage of the efforts.

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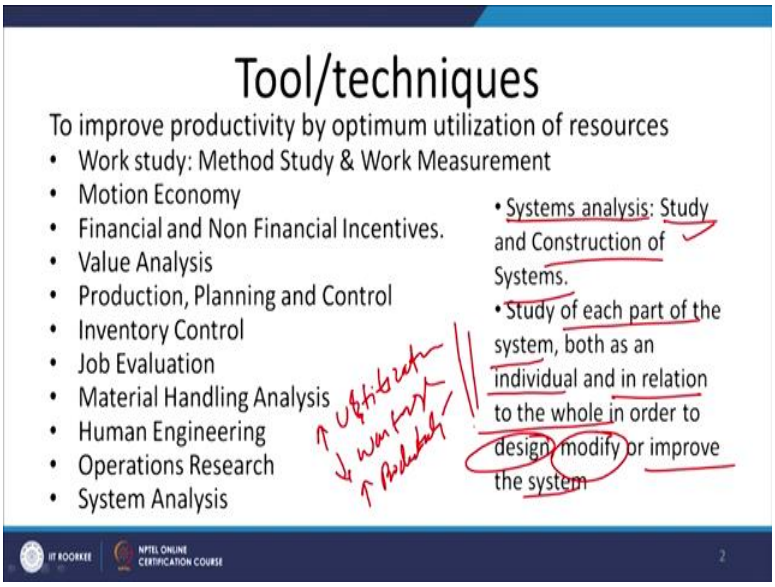

System analysis, this is another tool which is used to analyse the given component and the role of the component with respect to the entire system to see where wastages are taking place and what can be done in order to increase the utilization. So here, this is what we will see. The system analysis basically involves the study and the construction of the system. So, it has it will involve with that different aspects related with the given work and it will suggest really what should be done.

So, study and the construction of the system which involves the study of the each part of the system at individual level as well as the study of the system in relation to the other components or the whole of the system in order to see how it should be designed, how the system should be modified, so that it can be improved in order to increase the utilization, reduce wastage, improve productivity. So now, these are the different tools, there may be additional tools, but these are the most commonly used and very important tools as far as the industrial engineering is concerned.

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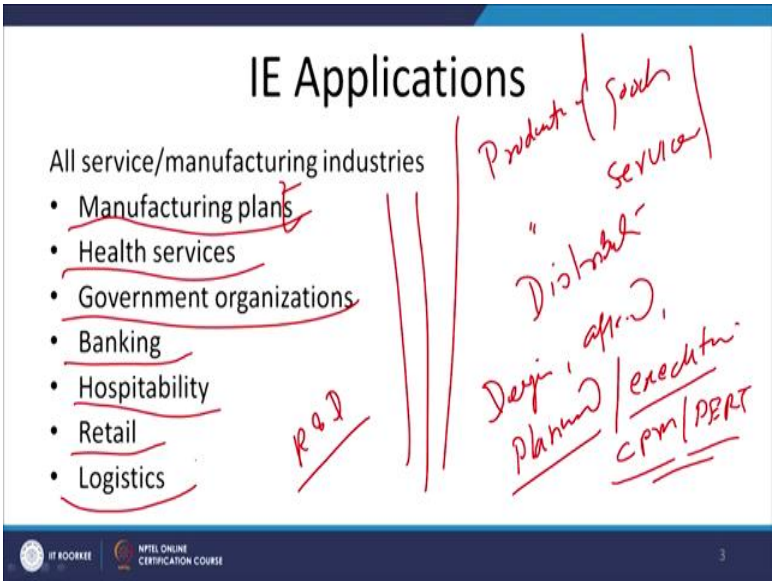

Then we have the applications of the Industrial Engineering. As we have seen it, industrial engineering can be used in both production of goods or production of the services and the distribution of these as well, production of the goods, production and distribution of goods and services. So, it can help in developing the suitable manufacturing plants.

It can be used in in optimization of the way by which the health services should be designed and offered, in government organizations also industry engineering can be used to see really how the different activities should be planned so that they can be executed. And the projects can be completed well in time using the techniques like the CPM and PERT. It is also very useful in the R and D organizations where hundreds of the activities are to be done by the different parties.

And if we want that project is completed on time, then these techniques are found to be very useful. For designing the, in banking also for designing the flow of the work, it can be effectively used to see really what are the locations where bottleneck exists or how the resources or the manpower can be readjusted and relocated to see, the loading is uniformly distributed and the response time nine to the customers is minimum.

In hospitality industry, in retail industry also this is retail and logistics, the industrial engineering is effectively used in order to increase the productivity, reduce the wastage and provide the good response to the customers so that the customers can be delighted. Now, I will summarize this presentation. In this presentation basically, I have talked about the

different tools related to the industrial engineering and where the industrial engineering can be used. Thank you for your attention.