Ergonomics for Beginners Industrial Design Perspective

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Module No. # 01

Introducing Ergonomics and Content Details

Lecture No. # 01

Introduction

So, now, today, we will start ergonomics for beginners with special reference to industrial design perspective. Now, if we, for this, if we look at a picture from our life that says that a horse cart is carrying a upside down boat and a man is on its top. So this is a need, we can say because it is also being used.

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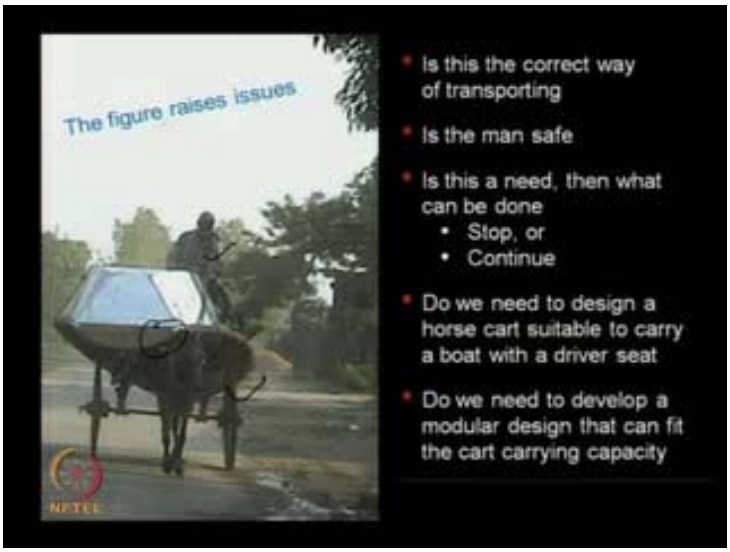

Now, the figure raises some issues like, is this the correct way of transporting? Is the man safe here? Is it a need, then what can be done to stop this practice or to continue? If we need to continue this practice, if there is need in somewhere, then what can be done for that?

Now, we can say that - do we need to design a horse cart for this purpose, suitable to carry a boat with a driver seat somewhere here; so that the driver can drive this cart. Then, of course, some question comes - what would be its seat design and other things? Do we need to develop a modular design that can fit the cart carrying capacity, like the cart can carry some other material, if it is necessary, then this type of boats, like boat and that type of big item, can also be carried.

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Then it comes, so many issues are there: from the horse capability point of view, from system design and requirement point of view, from the man - the users - his point of view: whether he is feeling comfortable to use this whole system or to perform with his full capacity.

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Then, we can say that, yes, this is a need; so, we need to fulfill this need. Then is there any limit, how far we can go to solve the problems, then development to achieve efficient and quality life. Now, for what type of quality we are looking for, that gives you

comfort or safe operation or you can increase your performance in that with the full efficiency; that is, to use your own facilities whatever you have to its maximum possible ways or to do certain activities within your limitations.

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Now, you can see another example. Now, here you can see that a road, it is around 2 kilometer step in length and this is the matter where a bullock cart is seen here. From this end, when it comes to this end, it comes with full loaded; then this man sits here and drives the bullock; means, he has to take care of his material whatever he is carrying on his cart.

But while going back after unloading, this man takes rest and the bullock goes back alone. Now, I happened to ask this person, why he does it? Then he said that: sir, while going back, we do not need to look after anything, because the bullock is very well trained; he knows where to go and how to go and he walks in the same pace.

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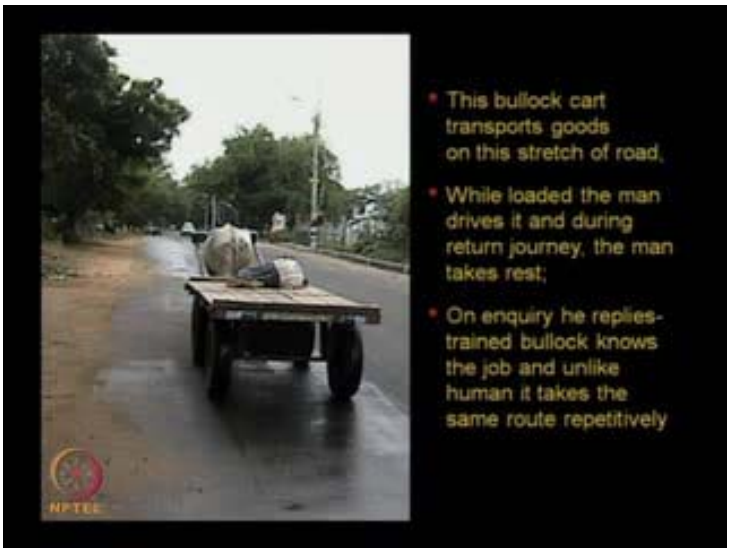

But then if this bullock cart transport goods on this trace of this road, while loading the man drives it and during return journey, the man takes rest; on enquiry he replies: trained bullock knows the job and unlike human it takes the same route repetitively. Now, what is the unlike human? What is the difference between human behavior and the animal behavior?

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If, we look into these aspects, then a lot of solutions, it can come up in our ways. Unlike, pet animals, human is ever creative. Now, we cannot follow a certain route blindly; we

always charge, ask - why I am doing this thing? And how we can make it better? And do not prefer repetitive and monotonous task. Always in creative mood, to explore newness, invites problems thereby, because he is always trying to do something new. And while making these new things, unknowingly some problems he also invites; thus, try to solve the issues again and thus continues the process and this is the human life. Now, this is the development in human life. Now, there are loop holes, are also there - how far we can use our body and our mental capabilities to adapt with the newer challenges.

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So, thus technology comes and due to technology advancement, our life, makes life easy and comfortable, easy going and comfortable, but if this technology does not match with our requirement or our body size, mental ability, physiological tolerance limit, then this technology, we cannot say that it is easy or comfortable.

Now, the thing is that, now the accessible to, accessible to, easily available ready mades. Now, when you are making ready mades, it may solve someone's requirement, but other may not like that; it may not suit to them and then what would be our approach? To have a common platform or with basic information about humans that can be used, so that maximum number of people can be benefited. More and more dependent on machines, that is our life is going on, so where we should match our compatibility with machine output and man's input? And that feedback system that is a subject that we need to study, and that is the ergonomics.

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Now, by this way, we can say that the progress. Now, we know that from this ape to this, this is the progress is happening and while in this progress to tell many constraints also we have invited. Now, progress leads complexity and hazards that every time we meet. There is a constant struggle to adapt changing environment with newer ambitions and lifestyle aids with limitation of human capabilities that leads to hazards and stress and it creates errors.

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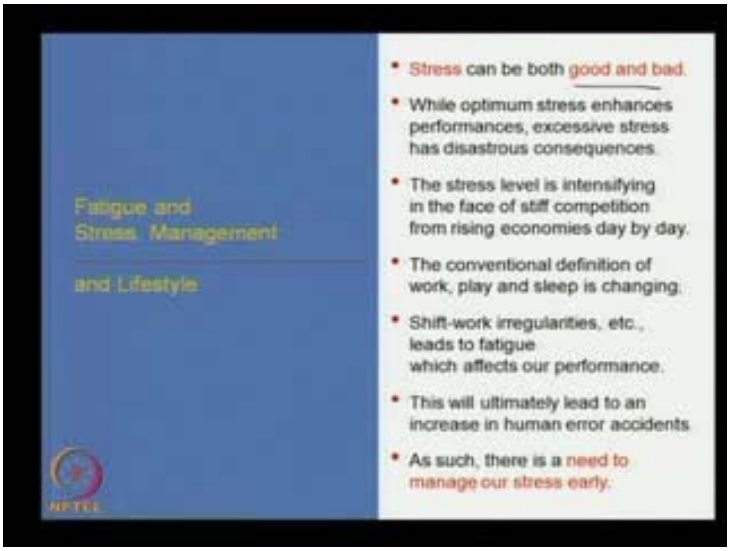

Now, fatigue and stress management and our lifestyle. Now, stress, it can be both good and bad; while optimum stress enhances performances, excessive stress has disastrous consequences. The stress level is intensifying in the face of stiff competition from raising economics day-by-day.

The conventional definition of work, play and sleep is gradually changing in order to adapt our newer lifestyle. Now, people also work in various time schedule such shift-work irregularities are also in place, right? And this leads to fatigue, which affects our performance and it is a productivity relevancies.

So, now, how we can solve this matter and what it does? Now, this will ultimately lead to an increase in human error and accidents and that we are facing everyday in industries, in our day-to-day home life and in normal activities. As such, there is a need to manage our stress early. This early, means, if we know the information sufficient at once in time, then while making some design or some technical output or technical advancement, we can utilize this properly then it will be within our control.

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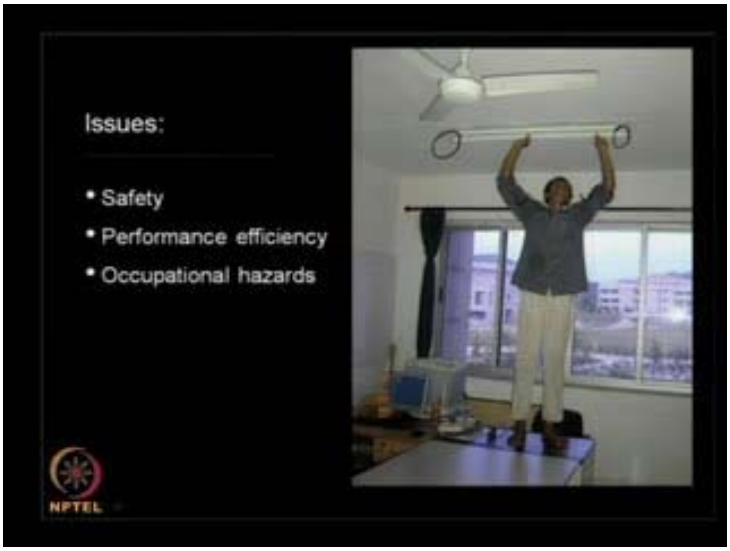

Now, if we take this figure, this figure as such it says that a person is standing on a table, this is an office cabin and he is changing this tube light. Now, after seeing this picture many thoughts are coming in mind. First thing it comes that this activity is unsafe, so safety is the matter; then, comes when he is standing like this way, he has to look upward

so this postural problem, neck pain and back pain etcetera are there, he experiences the static muscle problem in these regions, so neck problem and shoulder problem.

And as he has to put these, two edges, here in fixed position; so here, the time it takes; so to just to fit this tube light, it takes a lot of time and it raises performance efficiency question; It takes lot of time. Then occupational hazard - he may fall down, slip; so there are many group concerns, they can give suggestions to improve this whole activity.

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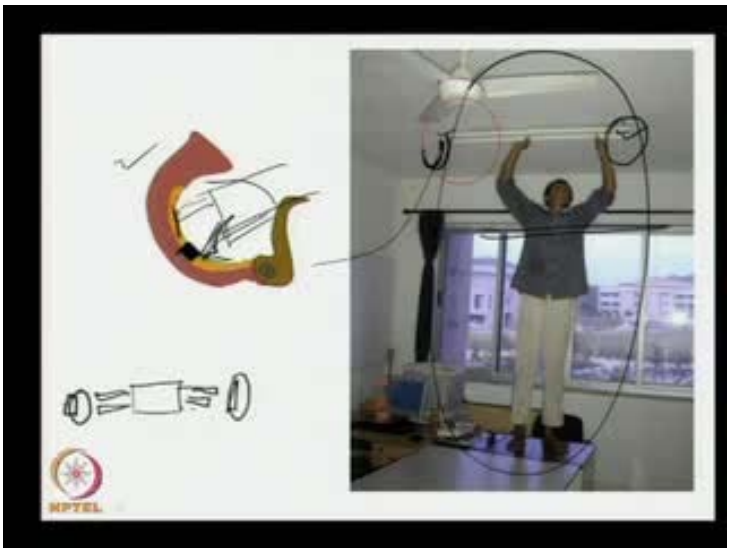

Now, we can see that, from design point of view, if we see, then it comes in these two corners mostly, what happens? This is the two corners, where there is a cutout spot is there and of this tube light, the two electrodes are there; that electrodes needs to be fitted in these two slots, but these two slots it happens not to be in the same position always. So, if this is at your eye level, then you can check it and you can change the thing as you require, but when it goes up your head, then it is very difficult to see these two corners at a time. So, quite often, it is seen that when this side is horizontal, this is not in the similar way in horizontal position; so, means, it remains in different positions; so there will be trail end error system to put in, to fit these electrodes into the two slots; so, it a difficult problem.

So, now, from design point of view, after studying the whole activity pattern here, we come down to a problem, that if we can solve something here that quickly we can fit in. So, this type of a development trial was made; it, is that this is a clip kind of thing, it may

be fitted here like, this way, fitted here and with these sides are the main electrodes fitting place, this is a gap here and this is a clip. So, just keep your tube light on this, so that what happens, your tube lights will appear like this way, like this and then you just press it; so, it will have a clip fitting; so, quickly you can put that two tube lights and fit it. So, by that way that, we can see this whole area from design point of view, and while doing this exercise or this solution, we have tested all the possible solution areas from the human point of view. It means his activity point of view, his physical point of problem, his psychological or mental performance facility point of view and his physiological tolerance point of view, means, what happens? So, we have tested all the ergonomic aspects and then we try to give some kind of design solution. And this area of study is design ergonomics.

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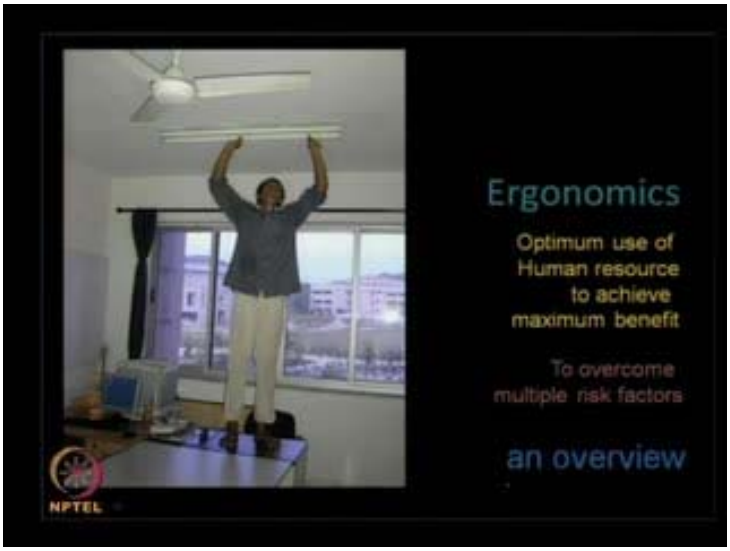

Now, in this whole module, whole course we will stress on this subject from various point of view. This is the ergonomics: optimum use of human resource to achieve maximum benefit for his own requirement and to overcome multiple risk factors. What are the risk factors are here? There is a physical, physiological and all other mental behavior oriented. Now, in this whole course, we will try to give an overview of these explaining all the different domains of ergonomics, but the stress will be on industrial design issues.

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Now, the design - design basically looks to the human aid to lifestyle, when our lifestyle changes to support that new designs we are developing day-by-day. But the matter is that if it is not properly used then it gives malfunction; if misuse, then it gives hazardous and it makes troublemakers. Now, design looks into aiding and facilitating arm to the human natural ability, so that we can extend our activities, that is limited in our natural body. And, the means and methods of human information and application, in such endeavor is the area of ergonomics.

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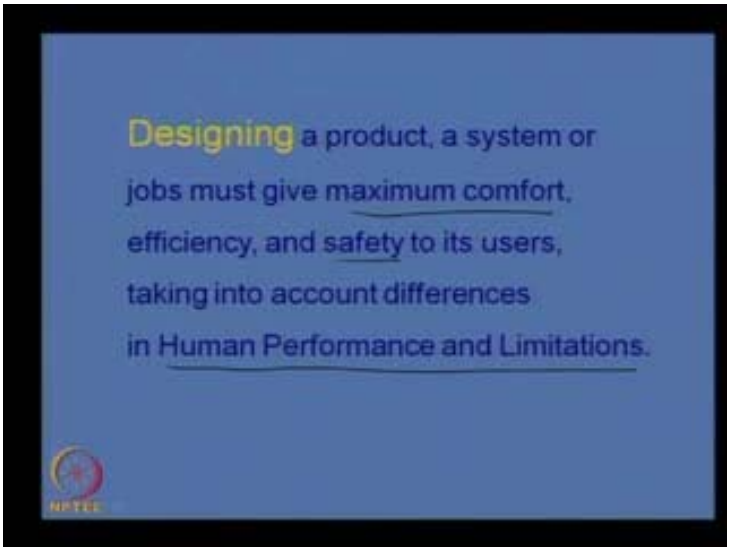

Now, designing a product, a system or jobs must give maximum comfort, efficiency and safety to the users, taking into account differences in human performance and limitations.

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The work, the environment and the tools are designed to improve efficiency, quality, satisfaction and more importantly, to eliminate human error and fatigue. So, how we can do it, that means and methods, we will discuss in following classes.

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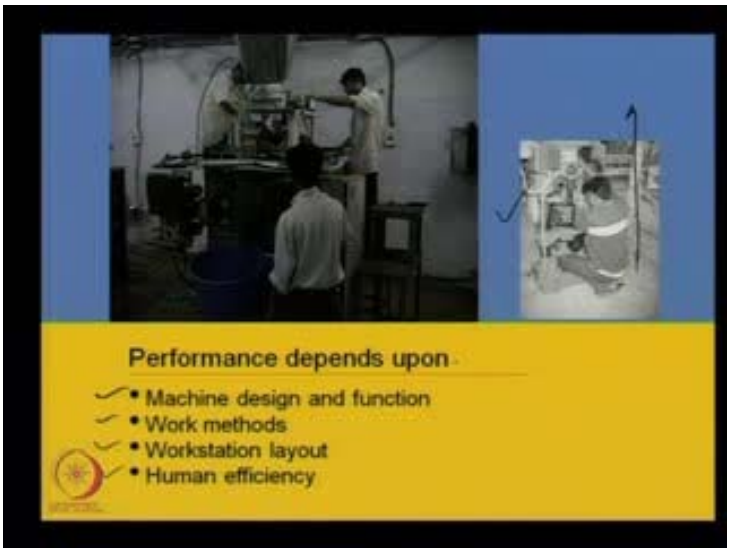

Now, if we see, this is an industrial activity. Here he has to stand on unstable stool, he has to look into this aspect, what is happening here and then he has to fit the material and his working posture is also bent. And so, in this, there is some problem, we can face here. Another point is that in this figure, this man while concentrating on this work area in a standing posture, he cannot get a proper view; so he has to squat to get a proper view here, then what can be done? We cannot change the man, but whether we can modify this working area that height or maybe some viewing clearances, means, we can design this machine itself.

So, now the whole performance here, performance, depends upon machine design and its function, work methods, workstation layout and human efficiency. Now, what are the factors that reduce the human efficiency? If we know the human activity pattern and other limitations, then it can be decided on new development strategies.

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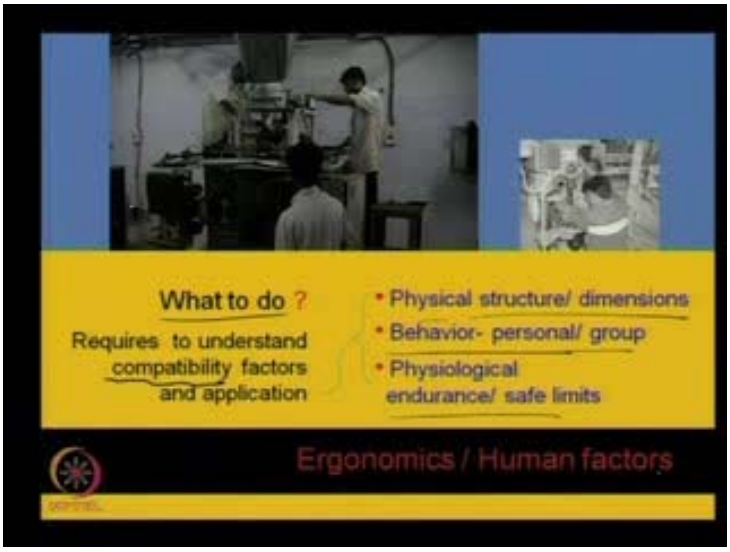

Then in this case, what to do? It requires to understand compatibility factors and application. Compatibility factors between the machine, the environment and the man - the prime system component, it is compatibility has to be there and it has to be both ways dialogue. Then on what compatibility we are looking into? This compatibility in terms of physical structure and dimensions of the human beings; human beings behavior, that is, personal and group, some behavior it depends on individual to individual and there is some set of behavior that depends on or that is followed by a particular group of people.

So, that is a stereotype and etcetera. So that we need to understand and application in a proper way.

And finally physiological endurance and safe limits - if we do some activity and while doing that if it crosses our physiological limit to perform the task, obviously, we will feel fatigue. So, what will be the endurance limit and safe limit, if we can recognize, then the activity will be reduced. And this is the ergonomics and human factors scope. And this is the ergonomics and human factors that we are going to discuss.

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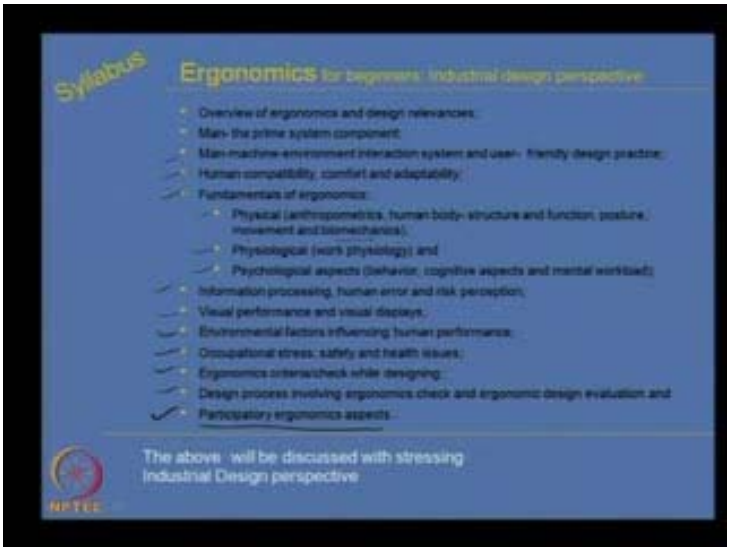

Now, if we see the syllabus, now the syllabus, I am just reading the syllabus, though it is already given, the ergonomics for beginners with specific reference to industrial design perspective - the first thing is that; first overview of ergonomics and design relevancies; man - the prime system component; man-machine environment interaction system and user - friendly design practice; human compatibility, comfort and adaptability; fundamentals of ergonomics - under this we will discuss physical that is, anthropometrics human body-structure and function, posture, movement and biomechanics.

Under physiological, mostly, we will discuss on work physiology and psychological aspects that is, behavior, cognitive aspects and mental workload while doing certain activities.

Now, information processing: in this section under information processing that is human error and risk perception, visual performance and visual displays, environmental factors influencing human performance, occupational stress, that is, safety and health issues, ergonomics criteria and check while designing, design process involving ergonomics check and ergonomic design evaluation, it means, after developing certain design, we have to evaluate whether it really performs the expected task and from ergonomics point of view how to evaluate this? The participatory ergonomics aspects, it means, ergonomic, it is not only while developing something, that all the information and suggestions will be given to the users, instead that, in that developmental process how we can make those users or beneficiaries directly involved in that development process, so that whatever they are developing it will be sustained though that experts or the expertise are withdrawn.

So, how to make the participatory approach for any kind of development? That we will discuss. The above will be discussed with stressing industrial design perspective, first activity.

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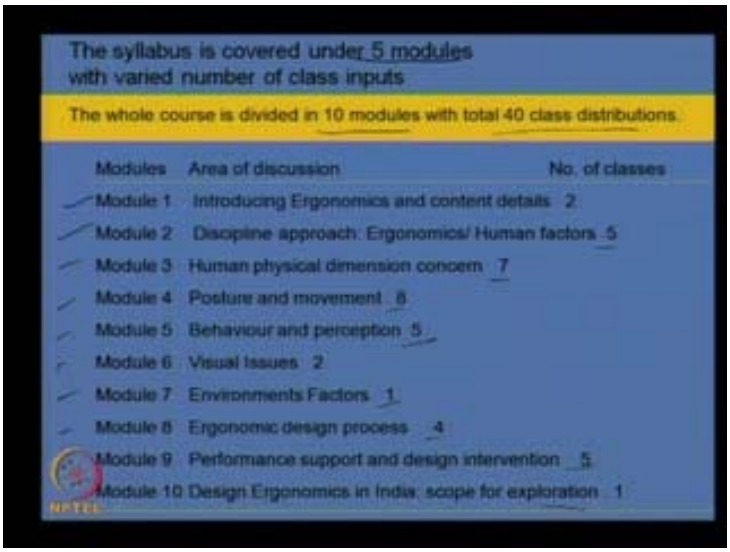

Now, the whole syllabus will be discussed in under 5 modules. Now, these modules again are totally divided into 10 modules with total 40 class distributions. Now, under these modules - the first module - introducing ergonomics and content details, there will be 2 classes. Now, in first class, we are introducing what is going on. Module 2:

discipline approach - ergonomics and human factors, here around 5 classes will be there; Module 3: human physical dimension concern, here how to measure the human body dimensions and its statistical applications and its design application that with covering these aspect, around 7 classes will be there.

Module 4: posture and movement, here around 8 classes will be there; Module 5: behavior and perception, 5 classes; Module 6: visual issues, 2 classes specifically, visual ergonomics aspect; Module 7: environments factors, that is, heat, humidity, ventilation, vibration, etcetera, it will be covered with 1 class; Module 8: it concerns ergonomic design process there will be 4 classes.

Module 9: performance support and design intervention; that is 5 classes And Module 10 - the design ergonomics in India, what is the latest position in India and which institutes are doing what type of activities and etcetera, and where we are going now. And the scope for exploration, there will be one last class, as a concluding class. So, by this total, the plan is that totally within total 40 classes, this will be over under 10 specific modules.

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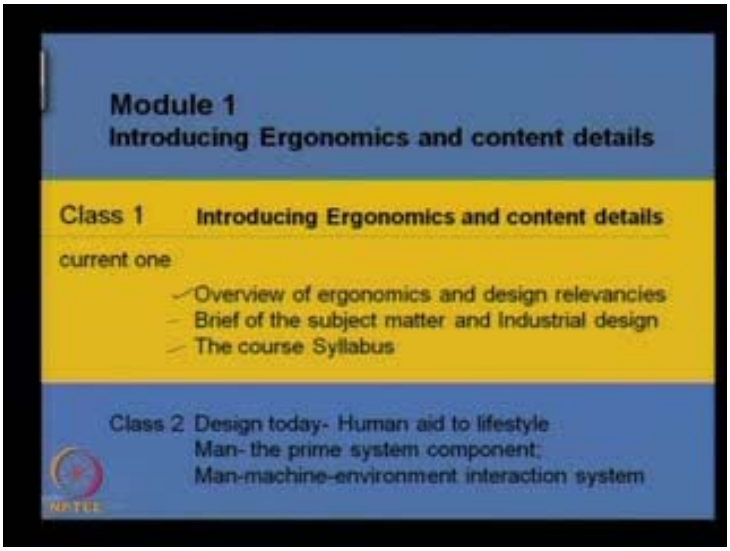

Now, the current session is - module 1 - that is, introducing ergonomics and content details. Under this, class 1 that is a current one, we are discussing introducing ergonomics and content details; that we are covering overview of ergonomics and design relevancies, brief of the subject matter and industrial design, the course syllabus, just now we discussed. In next class, we are going to discuss: design today - what is the

status? Today - human aid to lifestyle, under this we will see man-the prime system component will explain this. And man-machine-environment interaction system, this we will stress on it.

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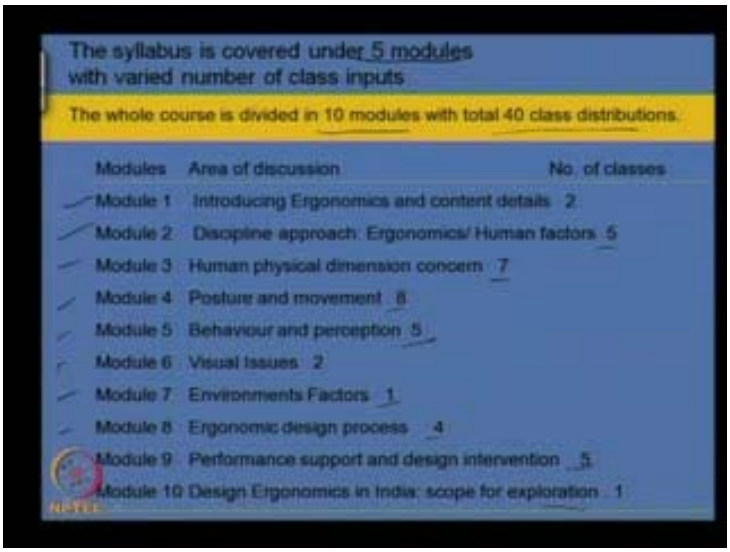

Now, if we see the total from the beginning of the slides. Now, we can go back just as a review, what we have discussed today? It is that we have discussed today with one event in, one picture from our life and what it is the need for justification? Then another example, we discussed is that behavior aspect of man and animal; man needs always to do something new, he does that when he feel some problem, he tries to solve it again, and by that a total developmental process is going on.

Then we have seen how development is creating our problem. So, we have to wisefully select the developments, whether that meets our requirement or just as a new thing, we have to accept and we need to adapt ourselves in that system or as we need our requirement we have to invent or we have to invite the development, as it suits to us.

So, we need to see the different compatibility factors, physical behavior and physiological figures and this area is the ergonomics. So, today we have discussed this. And now, next class, we will see the design today - human aid to lifestyle, man-the prime system component, man-system environment interaction system.

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So, now, finally, we expect after the whole class is over, we may learn the quality design, the aspects of that, and that is through ergonomics issues and that with the design ergonomics. So, wish you good luck, next day we will meet again.