Ergonomics for Beginners Industrial Design Perspective

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Module No. # 02

Discipline approach: Ergonomics / human factors

Lecture No. # 03

Journey, Fitting task to man

So, welcome to this third session of Ergonomics for Beginners Industrial Design Perspective. Now today, we are starting the second module that is Discipline Approach Ergonomics and Human factors.

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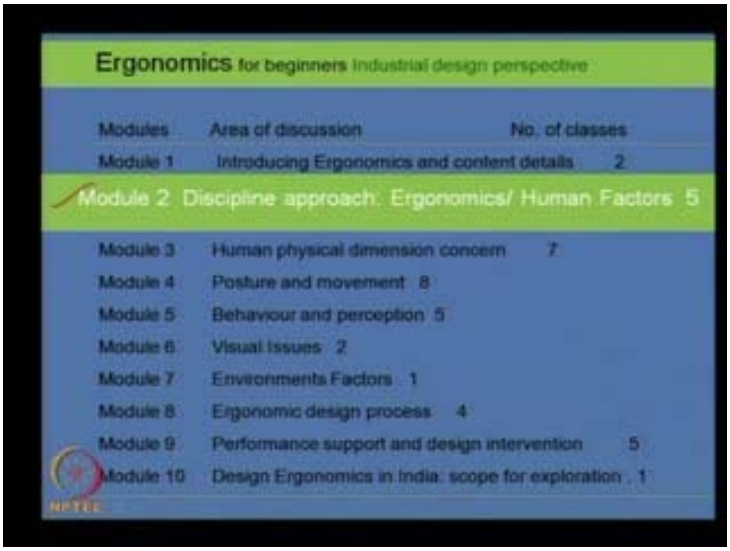

Here total five classes will be there. Now, these five classes are the sessions in this module are like third, fourth, fifth, sixth and seventh.

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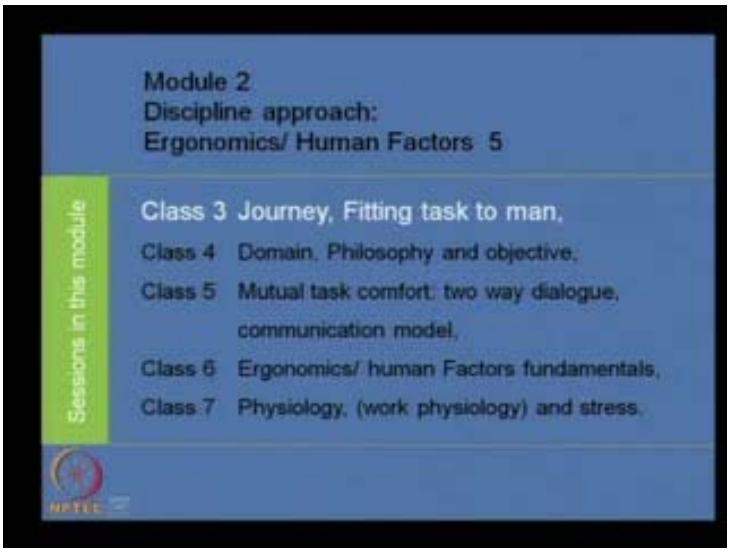

And today's class is journey of the ergonomics, the journey from how it is originated and where it is at present and fitting task to man.

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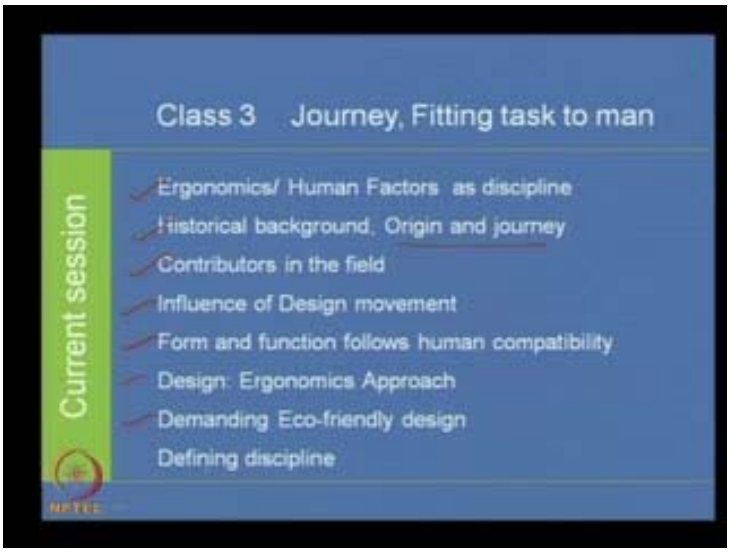

Now, under this the current session, we are going to discuss ergonomics the human factors as discipline, historical background - that is, origin and the journey, contributors in the field, that is the influence from design development and influences of that while developing or while inducing the subject and is origin from military, influence of design movement under this form and function follows human compatibility, design the

ergonomic approach and that is demand in today's design is demanding eco-friendly design and we will summarize it as defining the discipline.

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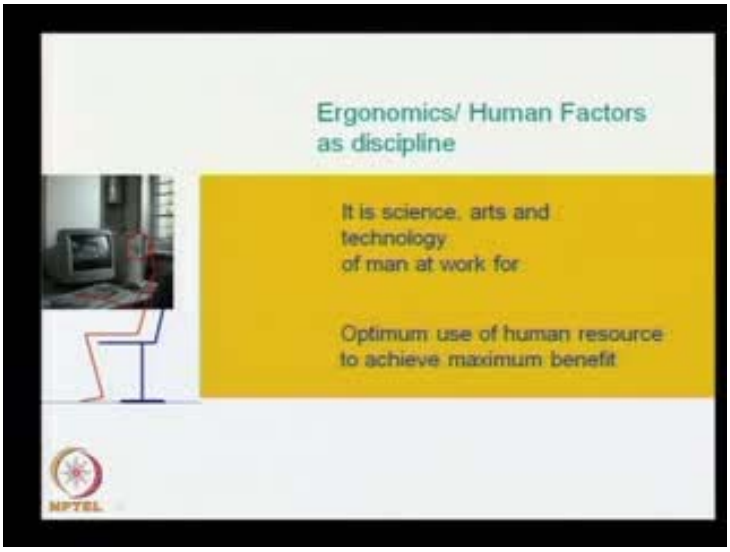

Now, ergonomics are human factors as a discipline, it could be said as it is science, arts and technology of man at work and the about the human information's are to be used for optimum use of human resources to achieve maximum benefit.

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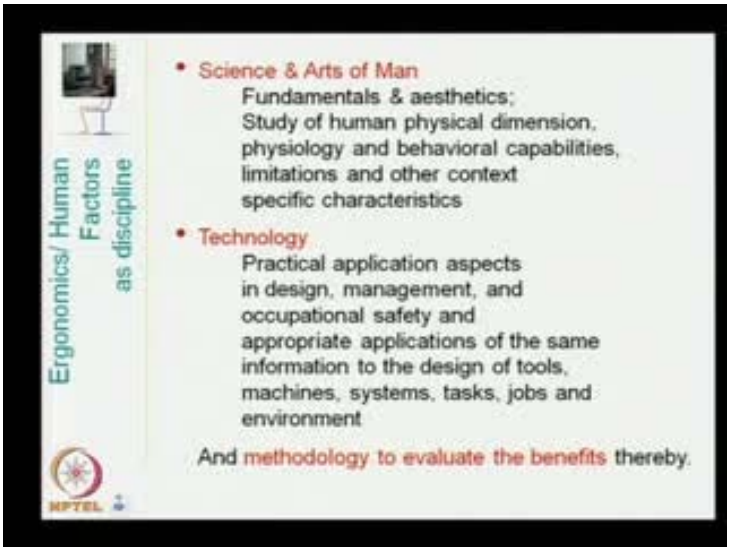

Now, under this we can say that why it is science and arts of man, because it deals with the fundamental aspects of human being that is the different starting from its structure to

its movement pattern and its behavior, how he reacts with the object in how he behaves within this environment. So, those are the fundamentals and it is his aesthetic perception why he likes something and some others not.

So, in this the study of human physical dimensions, the physiological aspects and behavioral capabilities, limitations and other context specific characteristics of human being are normally discussed. So, these are we can say that this is the science and arts of man at work as well as while he is taking rest and also it is technology, ergonomic is also technologic because the practical application aspects in design, management resource and occupational safety and appropriate applications of the same information to the design of tools, machines, systems, tasks, jobs and it is overall surrounding environment where he is working or where he is staying.

Now, finally, with this science of and arts of man and the technological applications after applying, it also looks into the methodology to evaluate the benefits thereby if after applying certain human information in design, in management issue aspects or occupational safety area, if the required benefits are not coming, then we cannot say that the application of ergonomics is proper.

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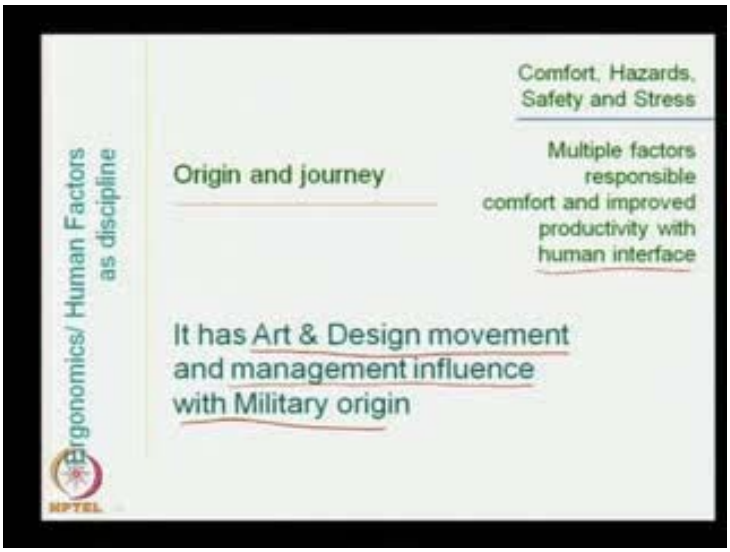

So, now by acquiring this knowledge, the users satisfaction leading to product acceptance in market will increase and during production, optimum productivity and sustainable growth be ensured. Now if we see, the ergonomics and human factors as discipline its origin and journey; it has art and design movement influences and management influence also with its basic military origin. Now at the beginning, it started into looking for the comfort hazards, safety and stresses that man facing in working conditions. So, multiple factors are responsible for comfort and improve productivity with human interface.

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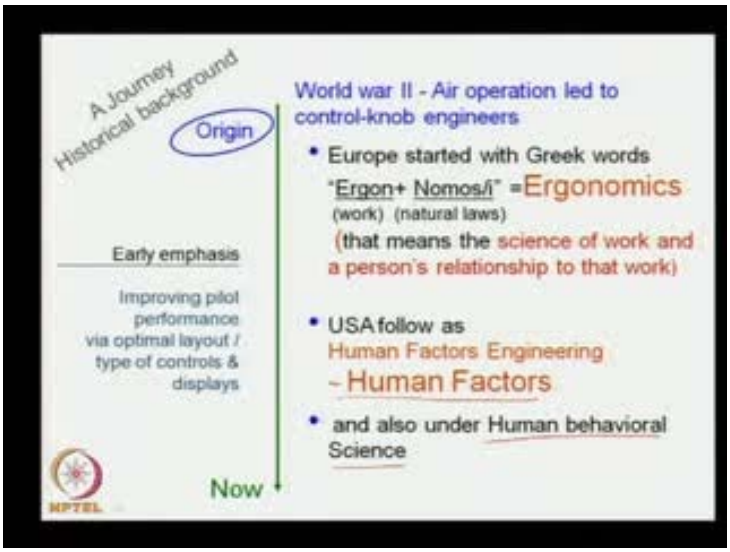

Now, at the beginning of this discipline, it has started with human interface mostly for productivity purpose. Now if we look into the historical background, the ergonomics and human factors sometimes it is the people or this discipline like that, sometimes only ergonomics and sometimes human factors. But now if we see that, is there any difference or it is the same subject matter, basically it is same subject matter, but from origin point of view it has some differences.

Mostly what is happened, the early emphasis was on improving pilot performance, that is for aeroplane pilots by an optimal layout and type of controls and displays means what is happened, during the world war-II, the air operation led to a specific group of people those who are mostly concerned on the control and knobs design, and its placement locations design etcetera they were known as control-knob engineers.

Now, how it came? Now it is normally said that, when aeroplanes were developed during this world war time, the pilots had some problem of flying then a group of people started looking into this aspect and then they found that all the controls-knobs and etcetera are ambiguous, the different reach values are not within easy control and also the viewing screen and etcetera are not proper. So, this trigger to start looking into the human aspects in the small work area, where he is using or he is facing or interacting with many mechanical components and space surrounding to that working area fully.

Now, at Europe it started as ergonomics; now these two Greek words Ergon and Nomos or Nomosi means that Ergon that is the unit of work or work, Nomos is the natural law, these two words combined together and made it ergonomics. That means the science of work and a person’s relationship to that work. Now these are the most unit of work, but from physical science point of view, these are means how we can say that some work has been done that if a force is applied then, the object if there is some displacement of deformatting set and etcetera, then we can say that some work has been done on that.

But from human point of view, it is that even when we are sleeping in an idle condition at that time also, we are spending energy. So, from this spending energy point of view, these are what is considered and so, the ergonomics term came to see whether the man when he is using a product or a machine, whether his work ability is within the limit of his physic, his energy level. So, this is the ergonomics. At the same time, in the USA they have started using the similar activities as human factors engineering.

Now, after certain time they found that, this area this is not only confined within the engineering aspects, but it has many other application areas also. So, they have finally come to this term human factors, at the same time or in some other areas under human behavioral science, this type of activities are also started like human agrology and etcetera some journals are also available.

Now, this was from origin point of view, this is the difference. Now human factors engineering and human factors, this given more stress on human body dimensions and psychology whereas, that ergonomics has started with a physiological base that is from human energy they are given more stress on that.

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So, from this origin point of view, we can say some difference otherwise, this whole ergonomics and human factors these are the same topic and now what is it? Now to address this specific aspect of humanization activities, most of the countries have their own societies with international body name IEA - International Ergonomics Association and this is their logo and the term finally, has come ergonomics and human factors or they use only ergonomics and sometimes, it is used only as human factors. In India also, we have Indian society of ergonomics, that is ISE and this is the website. Now in India mostly ergonomics application areas are design, management and in occupational health hazards, stress and safety aspects.

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So, with this we can say what the present status in India is and how ergonomics is being used. Now there are different there are many institutes, they are the ergonomic centers they are operating on specific inclination, that is likely defense institute of physiology and allied sciences, they use ergonomics for defense development purpose.

National Institute of Design Ahmedabad they use designing activities, National Institute of Occupational Health in Ahmedabad for occupational health issues, at Mumbai the Indian Institute of Technology Bombay that is industrial design center there, they look with the aspects of design, in Mumbai NITIE they also do that industrial management Center Labor Institute at Mumbai for labor laws and labor issues whereas, in some industries for health management like Sail, Bokaro, MRI for mine safety and etcetera, now BHEL at Thiruchirapalli looks after health management now on.

So, these all this centers, they are using ergonomics or practicing ergonomics with specific inclination. Now as you hold the subject, only Calcutta University - Vidyasagar University and Kalyani University at Calcutta at West Bengal, there the post graduate education under the discipline of physiology and a specialization course it is there and there all the aspects of ergonomics are being taught. Now, there are some other design institutes are also there and I am finding that IIT Guwahati under its department of design that ergonomics laboratory is there and here, we use the design technology under

bachelor's course, master's degree level input to design curriculum and for PhD with various issues of ergonomics.

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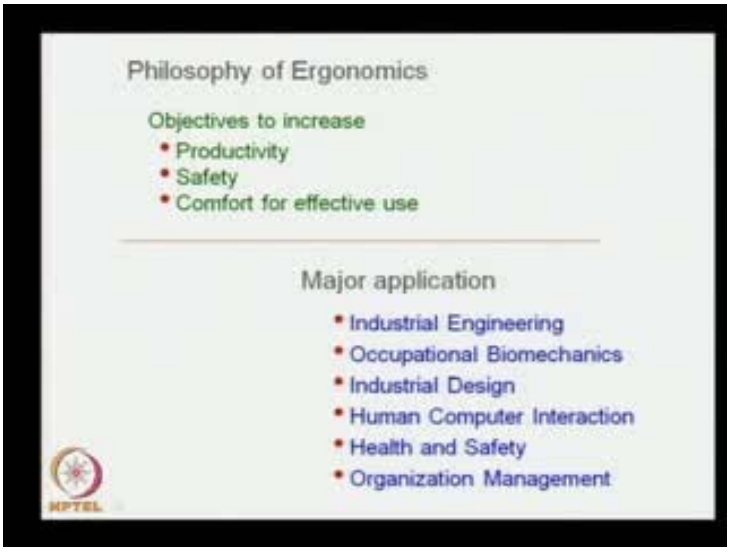

The list continues to some institutes of home sciences, agriculture, engineering and related disciplines and some within industries are also using ergonomics for their specific product development purpose. Now the philosophy of ergonomics, its basic philosophy, and the objective is to increase the productivity, safety and comfort for effective use. Major application areas are industrial engineering, occupational biomechanics, industrial design, human computer interaction, health and safety, organization management.

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Now, with this we can say that, now the ergonomics as a specific discipline, it has started and also it has influence of design movement. Now we can say that, the art and craft with various influences it has taken two different routes, one has become design for mass to satisfy mass users and for mass production, and art remain as a masterpiece work. Now design origin if we see with influence of design schools, high professionalism came in art, artist started to make things in more practical, applicable and useable manner which causes deviation of art towards design. Art in its traditional way, the art is perceived as the matter of greater mental analysis, compels the mind of the painter to transform itself into the very kind of nature to become an interpreter between nature and the art.

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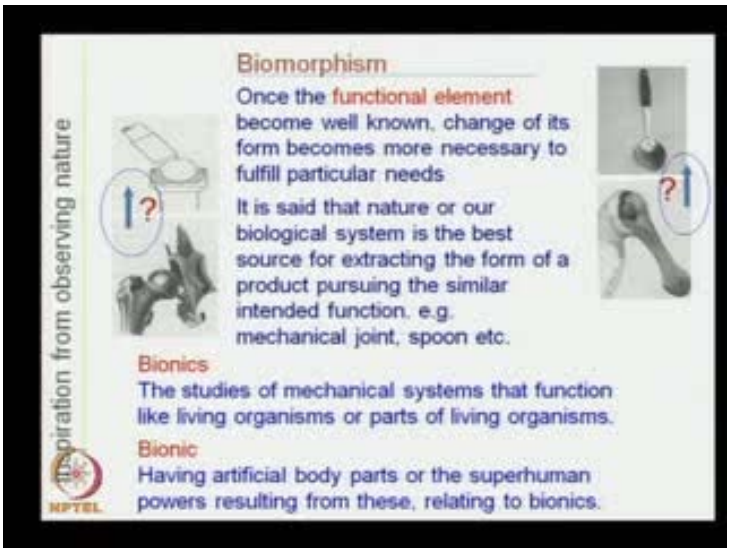

Now, as you say that, nature had influenced some thoughts; here basic thing come inspiration from observing nature. Now term always being used is a biomorphism, just for example, we can say that now this ball and socket joint is found in animals and humans, but for this ball bearing joint in mechanical, we are not sure whether the inventor of this ball and socket joint, whether they are influenced from this nature or another times this barred make and the spoon whether there is some influence we are not sure, but we take clue from here to develop further.

Once the functional element become well known, change of its form becomes more necessary to fulfill particular needs, it is said that nature or our biological system is the best source of extracting the form of a product pursuing the similar intended function; as for example, the mechanical joint here and the spoon can be sighted in.

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Now, another two terms the bionics and bionic, the basics studies of mechanical systems that function like living organism or parts of living organism. Now bionic that having artificial body parts or the super human powers, resulting from these relating to bionics. Now humanization in design, nearly every product we use, it is justified in asking exactly what it is means looking at the form and then we feel, what it does with the function. And finally, we try to look into how it performs, means linking these tools form and function with human compatibility features, whatever we see we try to analyze this from this points of view.

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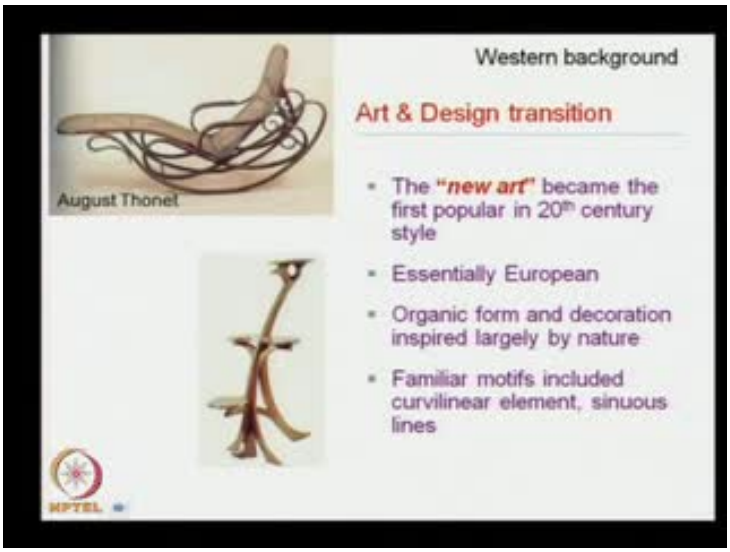

Now, if we see the western background of design development, art and design transition - the new art became the first popular in 20th century style. All these things look like essentially European, organic form and decoration inspired largely by nature, familiar motives included curvilinear elements, and different type of lines etcetera. Here the art form is generated, but whether human comfort point of view, whether it satisfies or not and how far it is satisfying that are being looked after.

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Now, form and design it also takes the human body figure type. Human body figure type by Bauhaus from 1919 to 1923. Now another object is that the designers started using different lines, the Stijl (1917 to 1928) they have developed some thoughts, Dutch for the style it is the name of a group of artists and architects, who set out to create a universal style in architecture, graphic arts and design. Using squares and rectangles in flat planes of bold primary colors along with black, gray and white all carefully orchestrated with straight lines.

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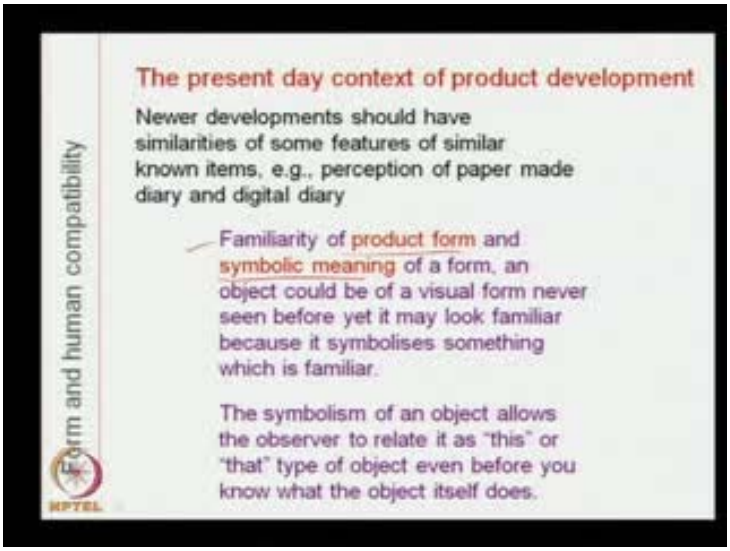

Now, these have generated specific forms, but how far it is human compatible. It needs to be considered and these configurations and the form new form generations have made today's journey of new design. Now form and human compatibility, the present day context of product development is that newer development should have similarities of some features of similar known items as for example, we can say that perception of paper made diary and digital diary.

Some 20 or little more before, a 20 or 25 years before, when digital diary came in market, people started buying that but then, it is noticed in Indian market that people are not happy with digital diary because, while enquired, some people, some response came that we are habituated using that paper made diary and that opens up in a horizontal mode, but in digital diary it appears in vertical mode. So, it does not get compatible, it

does not match with our own earlier understanding and also there are some other difficulties in this. Thus, people have started using that the paper mode of diary.

So, we can say that when we develop some new product, we must consider the past experience of the users of similar products, and then the newer development will be accepted by the people. Now familiarity of product form and symbolic meaning of a form, an object could be of a visual form never seen before, yet it may look familiar because it symbolizes something which is familiar, we need to consider this.

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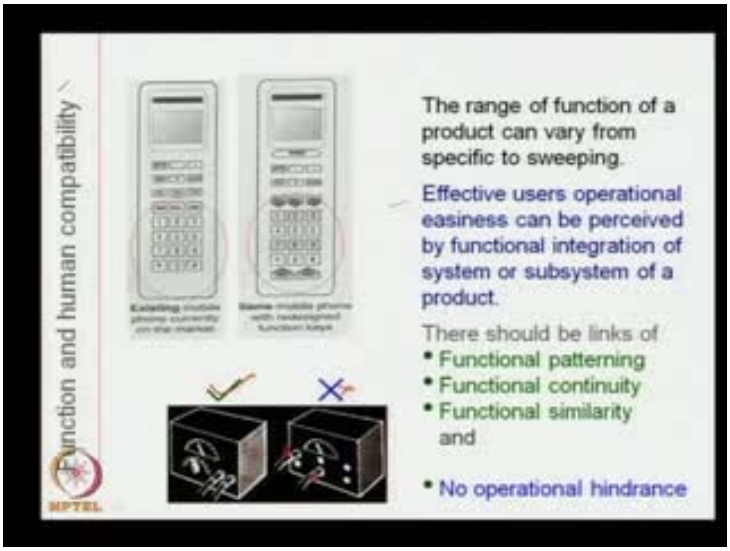

The symbolism of an object allows the observer to relate it as this or that type object, even before you know what the object itself does. So, these are the some of the aspects of design, that is form and human compatibility looks into. Now, the function and human compatibility aspect, if we see these two features of mobiles, here the switches and etcetera, how it works on it. Its acceptance is dependent; the range of function of a product can vary from specific to sweeping.

Effective user's operational easiness can be perceived by functional integration of system or subsystem of a product, there should be links of functional patterning, functional continuity, functional similarity and no operational hindrance that we can say from this figure. Suppose this is the visual area, where these are the two inputs and output, this is the switch and this is the visual (Refer Slide time: 29:45). So, to operate any one or to see this visual other are not getting any hindrance, but in this presentation, it does not

give; that means, when it is here, it is here so the switch has some problem and visual also some problem. So, its can we can say that so, we can say it is right and it is not means no operational hindrance should be there while making any layout pattern.

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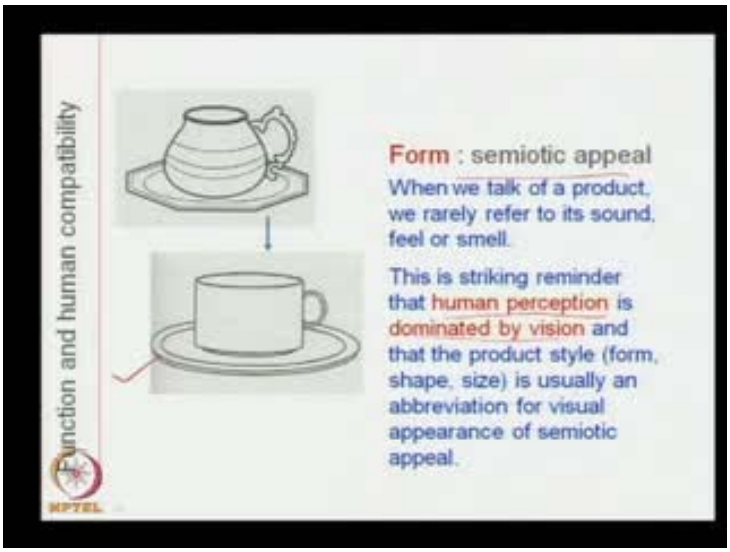

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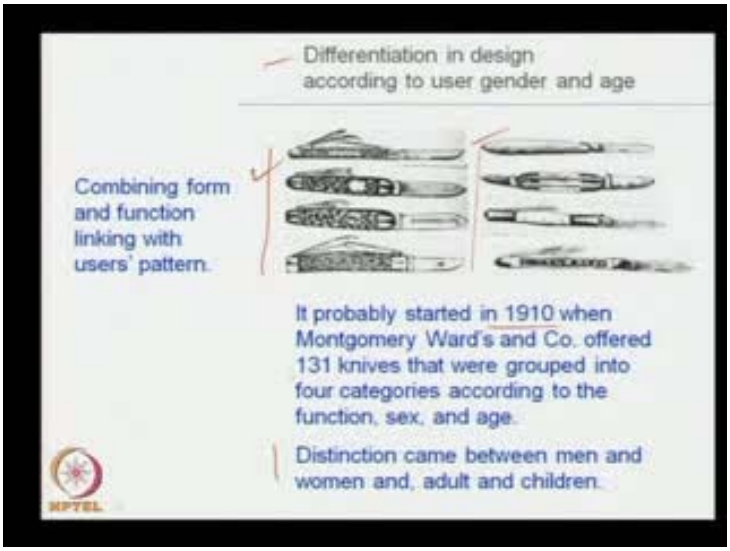

Now, function and humanity and human compatibility we also can say again that, how form says it is like in this cup has lot of curves and etcetera for making point it is also difficulties, for drinking also it is difficulties and for maintenance also it is difficulties, but in that case, the same purpose is being done with this, where it is more clear lines and

for mass production point of view, this is better. So, while making form and a semiotic appeal, we need to consider it when we talk of a product, we really refer to its sound, feel or smell; this is striking reminder that, human perception is dominated by vision and that the product style – form, shape, size is usually an abbreviation for visual appearance of semiotic appeal. Now another thing comes that gender issues, and gender and age issues and design thoughts, differentiation in design according to use of user gender and age.

Now, there are some knives it says that from male after looking it, it seems that a group of things are males and female types of it. It probably started in 1910 when Montgomery Ward's and company offered 131 knives that were grouped into four categories according to the function, sex and age; distinction came between men and women and adult and children at that time.

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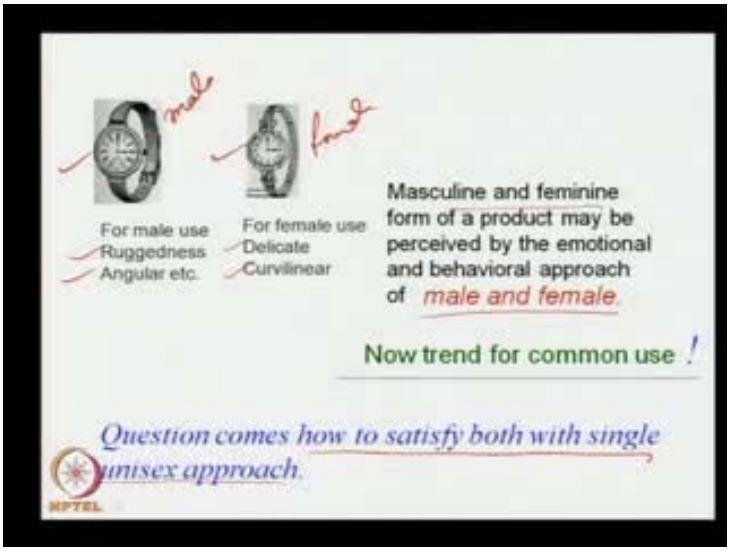

But, always it is not true because now what is happened? People like unisex products, now another object example we can say that so this watch and this watch if we see, it simply say that, it is male type and it is female type, but why? After seeing this form it says raggedness and more angular type, for female use delicate and curvilinear. So, what aspect gives us these types of feelings? If we can incorporate in design, then it may give male and female masculine and feminine form of a product may be perceived by the emotional and behavioral approach of male and female. These all are there, but now trend has come for common use, because the same product now must be compatible to

male use requirement and female use requirement. Now the question comes, how to satisfy both male and female with single unisex approach? Then we must need to know the common factors of male behavior and female behavior, these are the fundamentals of ergonomics issues, ergonomics knowledge.

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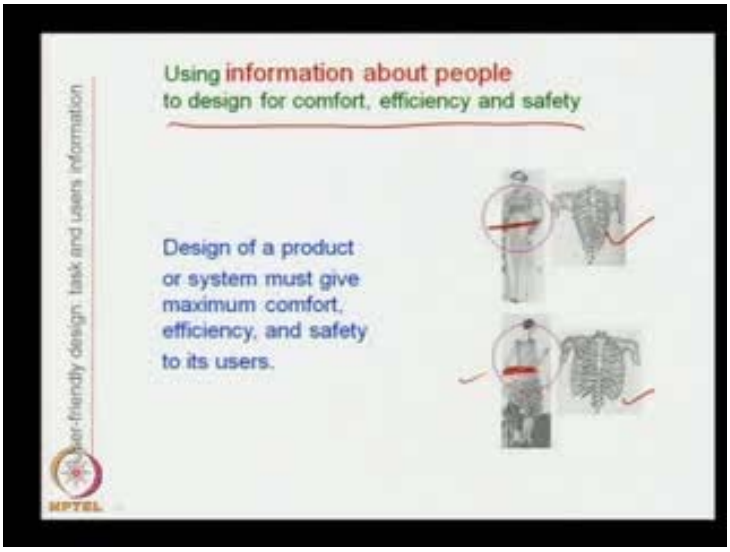

Now, if we see these two scooters, if we ask which one looks like male and which one looks like female. People can say this looks male type; this looks female types because this delicate look, raggedness look and etcetera. The product which is symmetrical have

clean lines making simple geometric forms, less ornamentation will be easier to process visually and hence we will have more immediate visual appeal. Now users friendly design task and users information, using information about people to design for comfort and efficiency and safety.

Now, if we go back few years back, then we can see that the present trend was to have narrower waist line and so, dress codes and etcetera also were there, but now that is not seen in market. Now, it has come more open waist area that type of designs, now a thought may come that perhaps in earlier designers, they are not much aware of our body structure and the problem and the figure; perhaps they thought our body structure is like this, but after that when the human anatomy and figure styling and etcetera are become well known.

So, then accordingly that dress code and etcetera are started changing plus one example can we sighted that, when Barbie dolls have come in market, a study says at that time those who were young kids, guns after certain age they found some problem of menstruation and etcetera some other problems. Then a small study reflected on this and then they said that probably, those kids they found that earlier Barbie doll body structure is an ideal. So, they try to maintain that and while trying to maintain that, the measures they have taken it was not proper.

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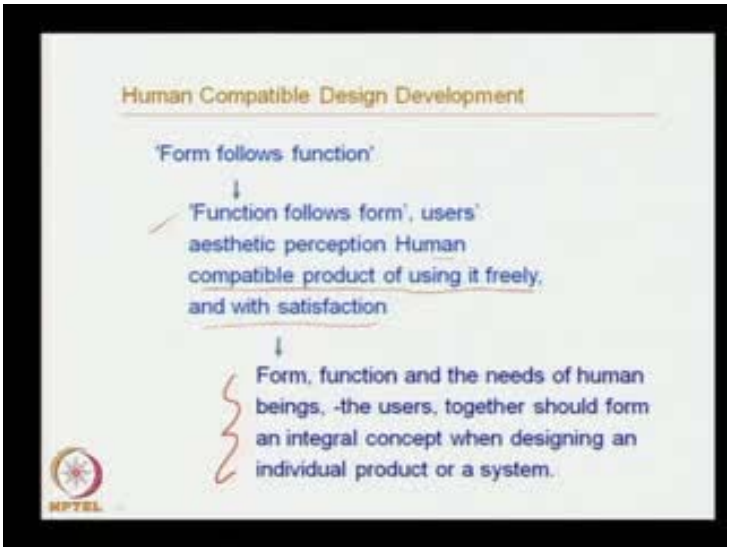

So, designing of a product or system must give maximum comfort efficiency and safety to its users. The human compatible design development it says that form follows function means, when we develop something some working components are first developed and then functional links between them or among them are developed and then a set is given outer safe to have an object.

So, here we can say that form is based on the functional elements inside; next level comes function follows form. When we came to know the internal components and etcetera, then users aesthetic perceptions human compatibility product of using it freely and with satisfaction, based on these things we can say that what would be the safe or total product and accordingly, we can modify the internal components and the link layout etcetera that we can say that function follows form that type of development.

Now, finally, we can say that form function and the needs of human beings, the users together should form an integral concept when designing an individual product or a system. So, in this case that proper ergonomics inputs have come in course and nowadays, products are more and more human compatible.

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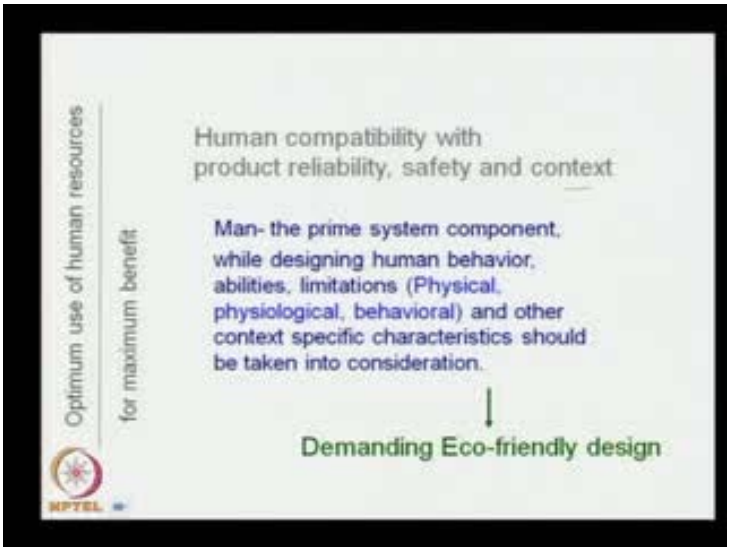

Now, human compatibility that optimum use of human resource for maximum benefitting; human compatibility with product reliability, safety and context man the prime system component, while designing human behavior abilities limitations, that is physical, physiological and behavioral and other context specific characteristics should

be taken into consideration. And now that these are it is demanding eco-friendly design, a sustainable design, what are the factors set here we need to study? In next classes, these will be discussed with some examples.

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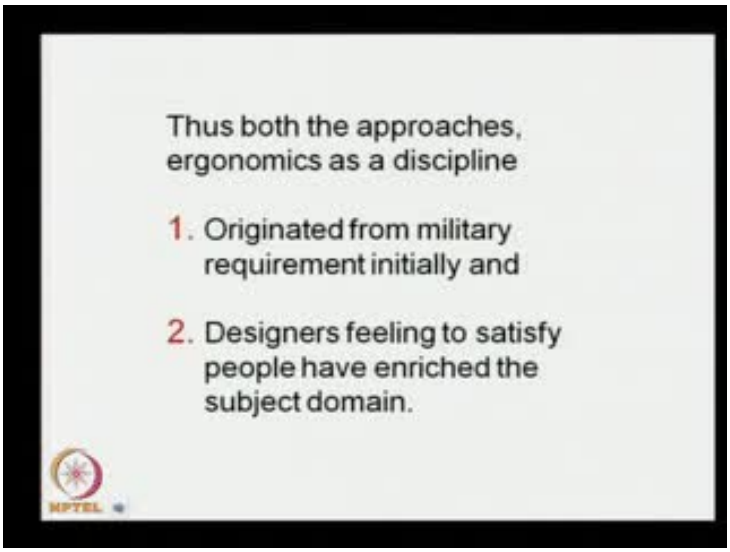

Thus, we can say that, both the approaches means from basic origin point of view, that is a military origin originated from military requirement initially and designers feeling to satisfy people have enriched the subject domain. Now, the whole the rest of courses the course material will be a mixture of the ergonomics basic fundamentals and it is design relevance's.

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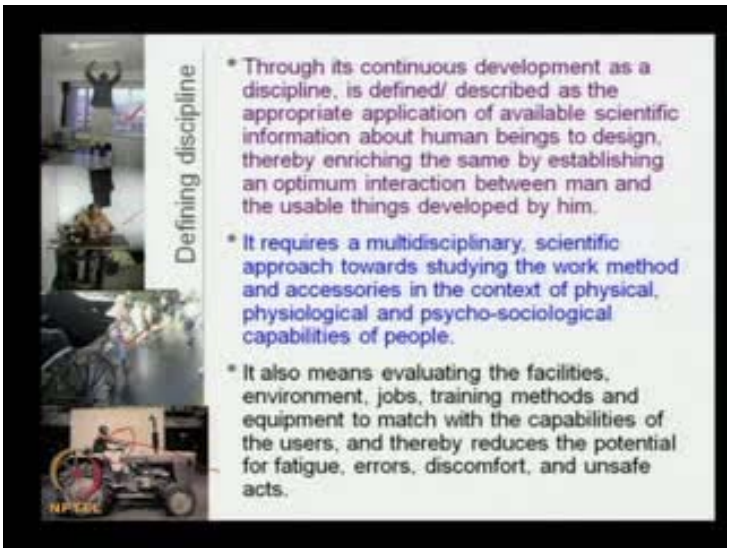

Now, the defining discipline, the defining discipline this is that occupational safety and design. Here also we can say that a person in sewing machine, still the man they doing total manual job for rickshaw pulling, the machines are developed tractors and etcetera the visual point of view, the vision, the reach values and work force and etcetera.

If we see this type of examples in our day to day life, from that we can define the discipline as though its continues development, through its continues development, as a discipline is defined or described as the appropriate application of available scientific information about human beings to design, thereby enriching the same by establishing an optimum interaction between man and the usable things developed by him. It requires a multi-disciplinary scientific approach towards studying the work method and accessories in the context of physical, physiological and psycho-sociological capabilities of people.

It also means evaluating the facilities, environment, jobs, training methods and equipment to match with the capabilities of the users and thereby reduces the potential for fatigue errors, discomfort and unsafe acts. These are the broadly we can define the scope of this, this ergonomics discipline specific to design and other applications in management and occupational health areas.

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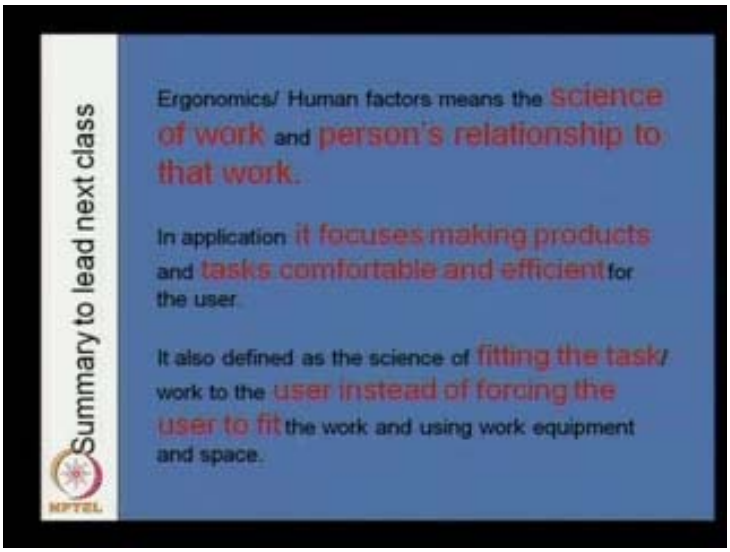

Now, if we summarize this today's course material what we discussed, the summary that lead to the next classes ergonomics and human factors means, the science of work and person's relationship to that work in application, it focuses making products and tasks comfortable and efficient for the user.

It also defined as the science of fitting the task or work to the user, instead of forcing the user to get fit in it, is to fit the work and using work equipment and space, means whatever we are developing, design, task, workspace etcetera, when we are acquiring some work equipment here, we must see what is the capabilities of man to use that. It means, the work area and design must fit the human limitations rather it is not be like this, that first procure the equipment to make your design the space layout and then ask a person to be there and work with that. We cannot modify man, we cannot change ourselves we can learn, but there is also a limitation by physical body we cannot change. So, whatever being developed it should be according to my requirement and here the basic fundamentals of ergonomics plays role.

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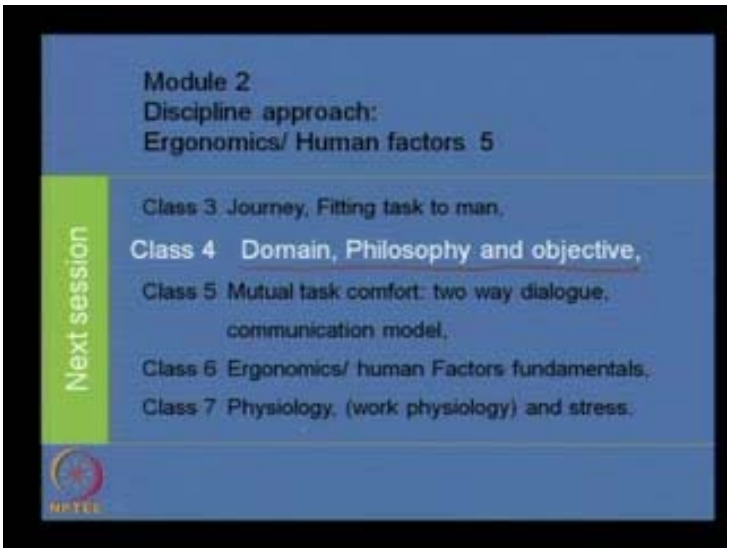

Now, in next session we are going to discuss that is the class number 4, the domain of ergonomics the basic philosophy and objectives. And rest we will follow the class 5, 6 and 7 that is mutual task comfort two way dialogue communication model and class 6 ergonomics and human factors fundamentals that is that physical and psychological aspect issues and class 7 that is physiological aspects mostly work physiology and the stress issues. So with this, we are concluding this today's session and in next session, we will see you again, thank you very much.