Product Engineering and Design Thinking
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Module - 08
Industrial Design, Design Entrepreneurship, and Design thinking
Lecture - 38
Industrial Design: Aesthetics and Ergonomics

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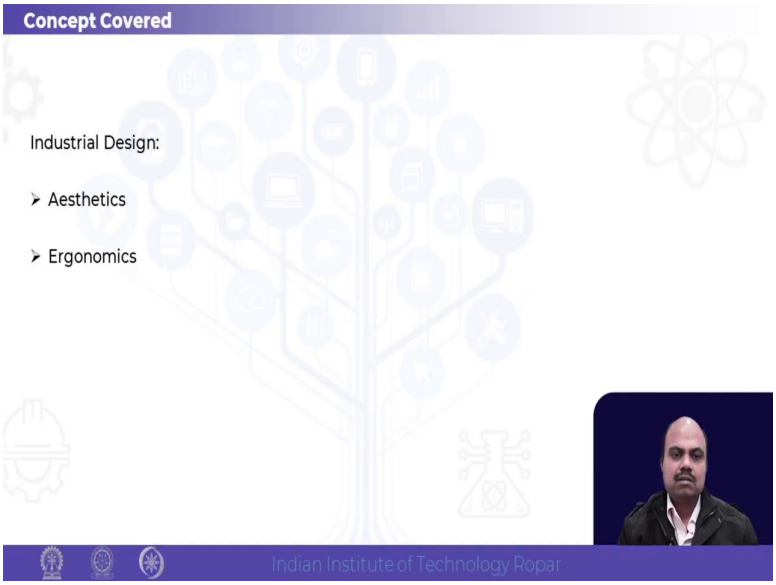

In this lecture we are going to learning about Industrial Design and with special focus on Aesthetics and Ergonomics.

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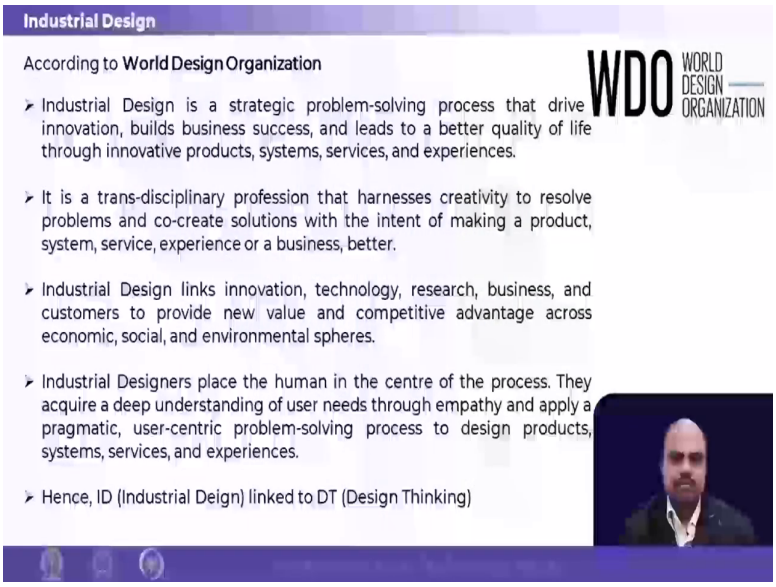

According to World Design Organization, industrial design is a strategic problem solving process that drives innovation builds business success and leads to better quality of life through innovative products, systems, services and experiences. It is a trans-disciplinary process profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, systems, services, service experience or a business better.

Industrial design links innovation, technology, research, business and customer to provide new value and competitive as the advantage over economic, social and environmental spheres. Industrial designers place the human in the centre of the process. They acquire a deep understanding of the user needs through empathy and applying a pragmatic user-centric problem solving process to design products, systems, services and experiences.

So, here as you see here that industrial design is linked to design thinking. Design thinking is helps a lot extensively industrial design and it is being used by designers a lot. Design thinking actually was inspired by originally by the conceptual design process especially in the product design phase.

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Industrial design is a professional, professional practice of designing products, devices, objects and services used by millions of people around the world every day. Industrial designers and their team that are aimed at improving your life through well-executed design this is what industrial design society of America, IDSA, telling.

So, now we are going to know about industrial designers, these are multidisciplinary teams. They are they can be having they are they are having strategists engineers user interface

designers, user experience designers, project managers, brand experts, graphic designers, customers, management manufacturers all working together say common goal.

But specifically, there are designers who are industrial designers. And this collaboration allows the design team to understand a problem to the fullest extent and industrial design are basically work with them and this craft a suitable solution.

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So, industrial design basically emphases of three different gems you can say functionality of a product, ergonomics of a product, aesthetics of a product. So, if you see any product take for example, this lock. So, here what is the functional of this lock?

The function of the lock is to lock basically to stop easily accessible ingenuity, accessibility of a of unintended persons, those person, those people who are intended to use or they supposed to use they should they will having this key and they will put this key and they will unlock.

So, this is the function of the lock, right. But when you talking about lock it has to be ergonomic also, imagine this lock is very heavy. So, it is difficult to use or imagine this is not easy to turn sometime old lock know it gets rusted in the ordinary turn that not ergonomic and also it is easy to hold you can see.

Now, aesthetic solution it is required it should look good. So, you can see it is chrome plated it is looking good easy to hold. So, all these three functionalities are important. Mobile phone if you see what is the use of this mobile phone? It is having multiple usage for calling, for recording camera it is, it should be ergonomic also it is easy to hold, ok.

The size is suitable for users for Indian users or the users who are using it the product aesthetic it should look good. And then the product is going to be purchased or used by the user and this is for everything, any product you take. So, industrial design is more concerned about all these three function things functionality is very important, then comes ergonomics and aesthetics.

Of course, there is not this is all not a equally important there are certain products where functionality is more important take for example, take for example, industrial heaters. So, their functionality is more important. The certain products where ergonomics is very important like bicycle handle, the certain products aesthetics is very important. Take for example, waste which is there on the table, they are since very important.

So, generally products will be having all three function all three concepts or gems or functions. However, the level of this will be varying. So, some products will have more importance functionality some will be little less, but almost all the products will have 3 these 3 things ergonomics aesthetics and function.

So, before you go deep inside little bit more depth in this one and as you know that each of these is very big areas and one has to learn individually. However, we go going to give little bit information on this first of all you have to understand that what is a concept.

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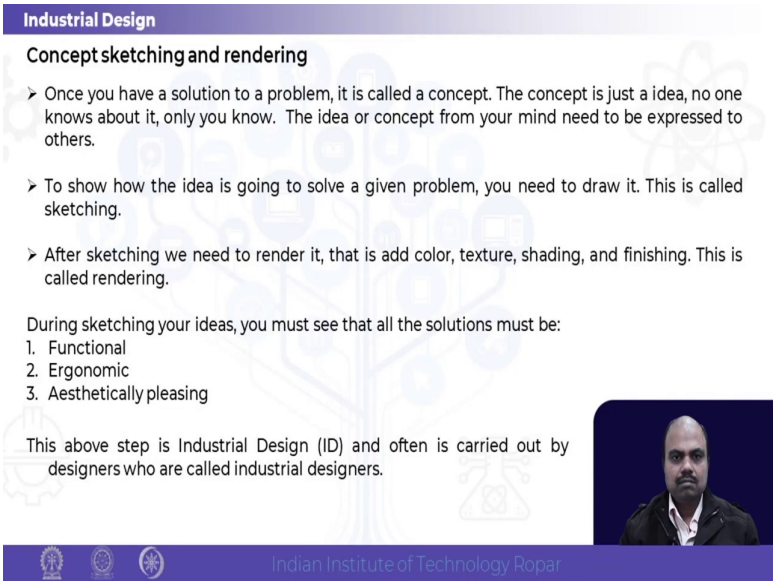

So, when we have an idea in our mind a solution, we have a concept so, but we have to tell someone, right. So, once we have a solution to a problem it is called a concept. The concept is just an idea no one knows until unless you have to express. So, I have idea and what is the idea? You tell, you have to write, you have to draw, you have to sketch, right. So, this idea or concept it is a mind and that need to be expressed by others.

So, what we do? We sketch. So, to show how the idea is going to solve a given problem you need to draw it and this is called sketching. So, you take a pencil, take a pen, on a paper, you

sketch, there are people who are more comfortable computers, they are going to sketch using a software tool and they are going to sketch it in computer using a tablet.

So, take for example, this is the tablet, on the scrap tablet you are going to use the electronic pen and they are going to going to get we are going to sketch it. But sketching is not enough always, you need to render it and because when you render it you add color, you add texture, how the texture is.

So, texture is smooth texture or rough texture, you need shading. Shading means how when the light is going to fall, how it is going to look like and finishing it. So, this is all the things are called rendering and this is equal to little bit of practice, but it is very important for especially for industrial designers to do a good sketching and rendering.

So, these skills are being often taught to industrial designers in the courses which they have that is either BDS or MDS. So, during the sketching you must have the solutions and think about what is the functionality of the product, how whether is there appealing to the users or not, whether aesthetically appealing or not, whether is there ergonomic or not.

So, all these things are important and these steps are generally being carried out by industrial designers. So, industrial designers and product designers basically similar areas. Basically, industrial designers are where they in industry the industrial designers will create, especially industrial designers product design they create products for the industry manufacture and then sell to the users.

So, industrial products they design, (Refer Time: 10:19) industrial products are being designed most of the medial products have been designed industrial product designers.

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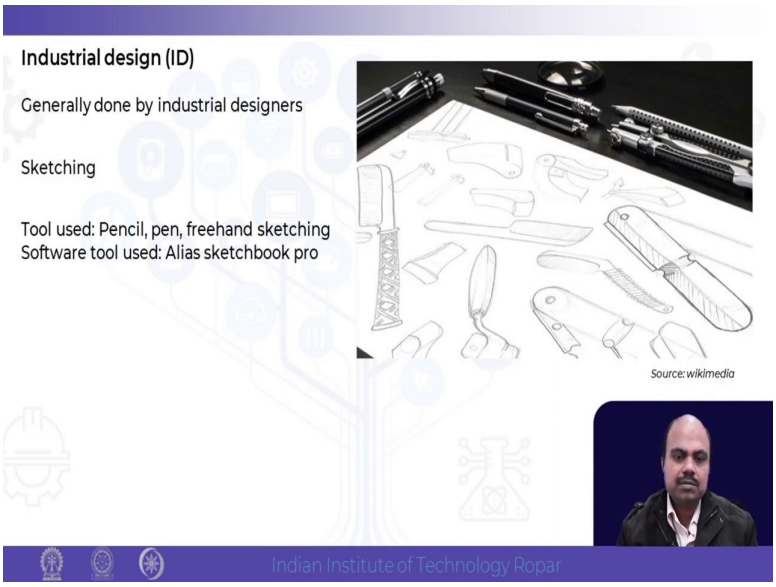

So, sketching, as you see in this image it can be done with the pencil pen freehand sketching, you can use software also like alias sketchbook pro. It is a software which is available to us and you can do sketching. And there is among lot of features also in the software like pressure sensitivity feature if you are having pen which having pressure sensitivity that can have like vacuum devices, they have the pressure sensitivity pen. So, I can show you one of the one such pen in this one.

So, this is pressure sensitivity pen. So, depending upon how much pressure you have if you draw this is going to come if you draw lightly or heavy is going to come in the computer. And for that you of course, you need a special device for this and there are many devices which are available, some of them are vacuum devices the company is also making.

But earlier sketchbook pro which is also available to most of the students as a free. So, you can use this as and when you require this tool. If you do not have pressure sensitivity pen you can use your mouse also. So, no problem, still you could be able to use it. There are also other features which are layers and in this software tool which will be useful for you, if you want to do sketching and rendering is also possible in this software.

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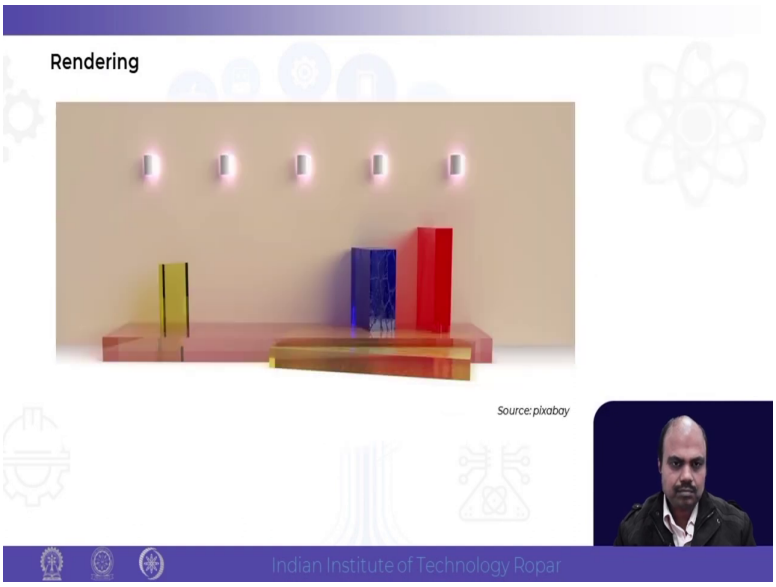

So, rendering, you can do many ways. You can do hand rendering by markers, pens, you can do using computer like you hand rendering you do and then scan it and then over that you do modification of then this. So, it is like a compute and partially hand rendered and then modified in computer. You can do rendering purely on computer. So, you generate the product in the computer.

You can do rendering by not by using pen and pencil, you can do a 3D model and the software itself is going to do rendering like SOLIDWORKS, CATIA, key KeyShot, (Refer Time: 12:42) is a very good rendering tools it is having. Now, this rendering tool should be helping and you can put lights you can put colors in that one and that you can do rendering.

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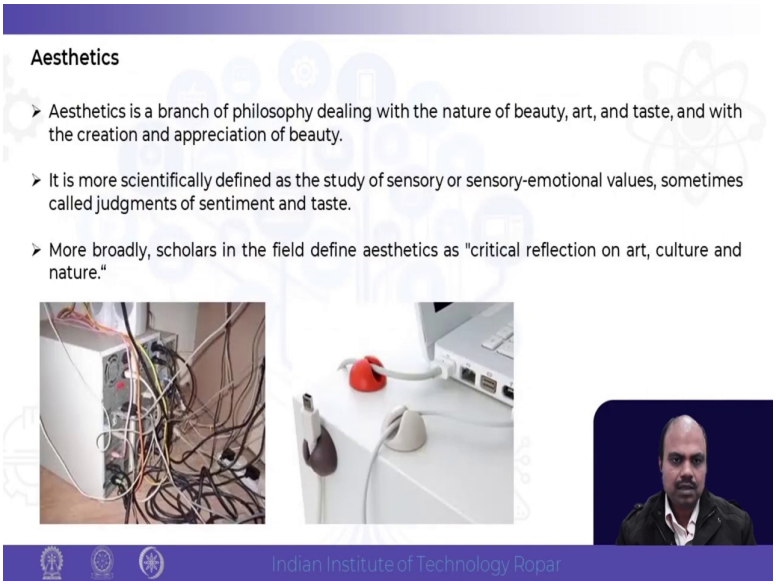

Now, coming to aesthetics. Aesthetics is a branch of philosophy dealing with the nature of beauty and art and taste and with the creation and appreciation of beauty. It is more scientifically defined as a study of sensory and sensory emotional values, sometimes judgment of sentiment and taste. More broadly scholars in the field define aesthetics at critical reflection on art, culture and nature.

So, there are certain rules of aesthetics that golden ratio, people like this ratio. There are also aesthetics rules and some of the guidelines for making aesthetics. People wants their gestalt

principles are there proximity, closeness, some of the principles which are involved in this one. So, if you keep two things together, it look as if there is a grouping. If you make it outside it will look different.

So, these are basically 2D in 2D aesthetic, but people are using 3D also. You can see many of the architects are using this philosophy. So, idea is what? Idea is basically to make people feel good about the product which they are using. And if they feel good they are going to recommend to other people, they are going to and other people are going to buy it.

So, when we feel good about the product, we tend to buy it. So, functionality is of course, important, right. But, aesthetics also important especially in automobiles, in mobile phone. Often especially in car functionality we know this car is going to go from this place to this place so far this is the these are the features of this car, but when it looks attractive to us we purchase, right. So, there are many products which we get influenced or attracted by the aesthetics looks and appeal of this product.

Once we feel attracted towards the product because of the aesthetics, we feel like having the product and using it. And that is why we tend to buy the product which are more aesthetically pleasing to us. Aesthetic it does not mean that only form, it has multiple factors form, color, texture. Then there are also factors like factors which are related to form a fielding and there are also like non visual factors like company.

So, take for example, Apple has make a new product whether it is looking bad or good we feel like buying like the Mercedes-Benz, it is not that other cheaper or relatively cheaper cars are not looking good, they are also looking wonderful, but the moment we feel ok, this is Mercedes which means that is. So, there are also some kinds of feeling in that one.

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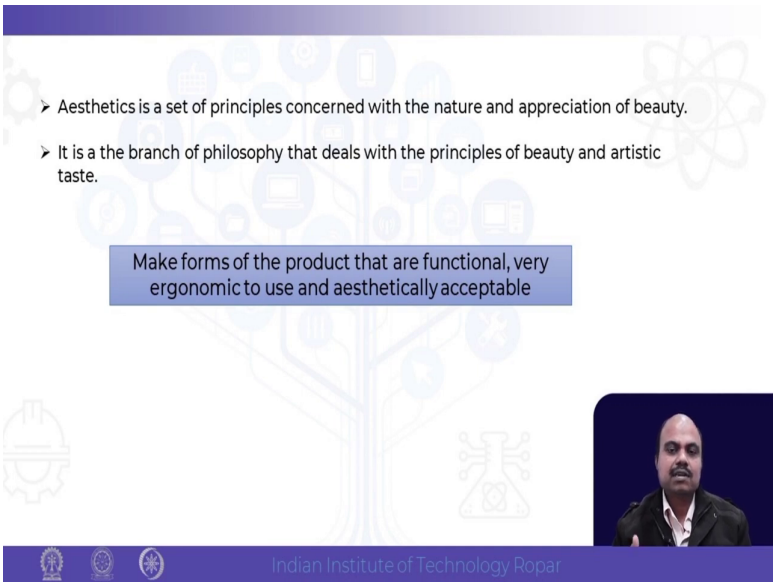

Aesthetics is a set of principles concerned with the nature and appreciation of beauty. It is a branch of philosophy that deals with principles of beauty and artistic taste. Make forms of the product that are functional, very ergonomic to be use and aesthetically acceptable. So, this is where is important as an industrial designers.

So, what the industrial designer does or as a designers or even when you are designing the product? We should make products which are functional. Because if the product is not functional whatever you aesthetics we do, whatever the ergonomics we do you are not going to work. People buy product only because it is functional.

So, imagine this lock is not working properly, ok. People are not going to buy it, but just because it is working properly it does not mean that people are going to buy it, right. They are going to buy because of various reasons one is functional, second is ok, it is a aesthetically

looking present. And then once they have aesthetically looking present ok, they are going to feel like ok, they are going to touch it and feel it. So, these ergonomics.

So, here each and every features are important, each and every thing is important. So, we should make products which are functional ok, very ergonomics to use. And ergonomics there are many things which are there it is very important to feel the user's perspective and make the make it more ergonomic and aesthetically appealing.

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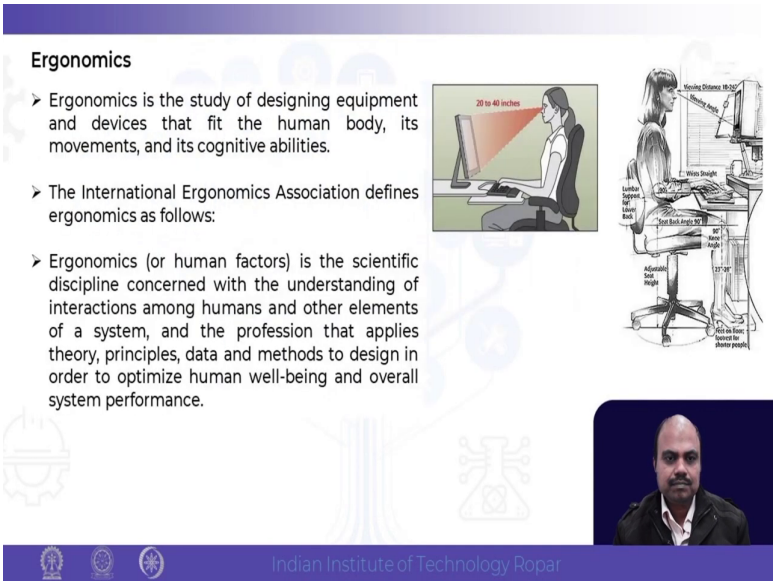

Now, we are learning about little bit about ergonomics. So, ergonomics is the study of designing equipment and devices that fit the human body, its movements and its cognitive abilities.

The international ergonomics association device ergonomics as follows ergonomics or human factors is scientific discipline concerned with the understanding of interactions among humans and other elements of a system and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

So, ergonomics is used widely. There are two sets of ergonomics physical ergonomics where we get to physical ergonomics, physical products and also then UIX related to how people see when they interact with a computer screen, mobile, software and other tools where we see and interact. So, there also aesthetics is important, there also functionality important, but here we are talking about ergonomics how people going to like or not and how they are going to interact with the user with the product.

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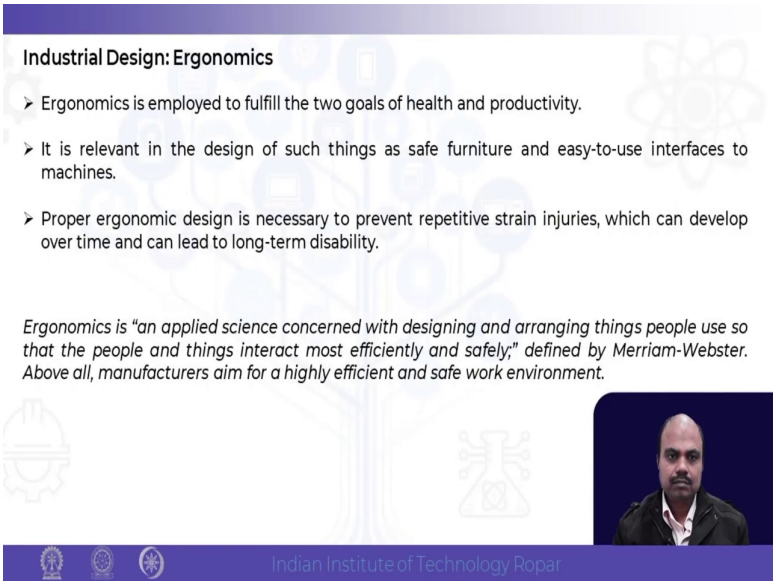

So, ergonomics is employing to fulfil the two goals of health and productivity. People should not make become fatty when using a product that you should understand. So, you should make the product which is more ergonomic. It is relevant to design of such things as safe furniture and easy to use interfaces to machine. It is important that there are many things that are in ergonomics, many is vast science and we are not going to discuss here, but it is very important that we make easy to use safer products, interfaces for the machines.

So, proper ergonomic design is necessary to prevent repetitive strain injuries which can develop our time and can lead to a long term disability. So, in a way that makes furniture equipment comfortable and effective for people we use it. You have to understand that people have limitations. And we are going to make products you should make the products which are people not only like it, but also should be able to use it for long time.

Ergonomics is a applied science concerned with the designing and arranging things people use. So, that people and things interact most effectively and safely. This is what defined by Merriam Webster. Above all manufacturers aim for a highly efficient and safe work environment.

So, work environment is also important. So, there another, there also ergonomics is applied not only products work environment, the way we see. So, many things there wherever human interaction is there ergonomics is important to use.

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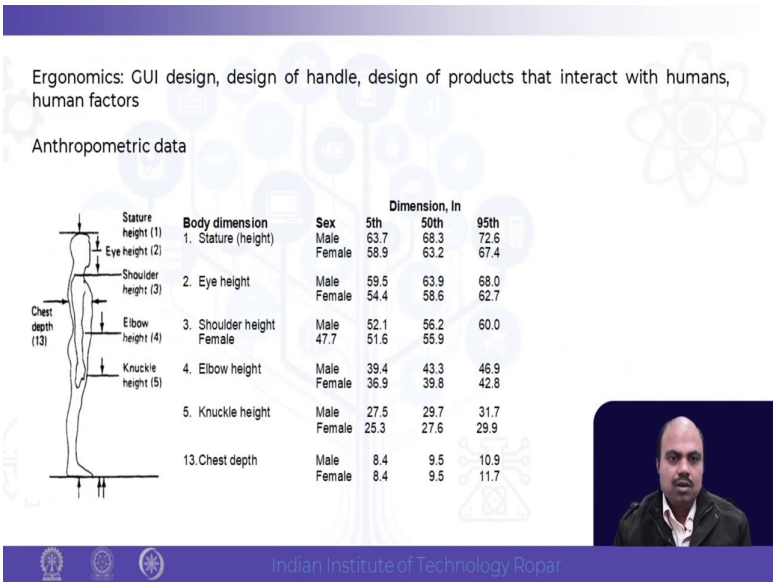

So, in ergonomics there is GUI design, design for handle, design for products that interact with human beings and human factors. Here one important thing is about the size of a product. So, how will determine the size? So, how do you determine, what should be the size of the mobile phone when people are handle using it. People do not use it.

See if I want to if I want to hold it like this, mobile phone and use it is so difficult, right. People use it this way. So, what is the dimension? If you make it thin it is, ok. If you make it thicker little bit this is ok, but more if you make it too much thick you are not going to work it is difficult. You make it too much thin that also difficult. So, there is a range is there. And this is for all the measurements.

Chair you take height, you will get you would have sit sat in various chairs with different height, different backrest right, this is backrest, different armrest, different (Refer Time:

22:28) Some of them we will feel comfortable, some of them we will not feel comfortable, that is true. Some of them we will feel comfortable now, but after some time we will not feel comfortable. Some of them we will not feel comfortable at all. Some of them after a first you little bit uses you will feel little bit comfortable.

So, you will find that sometimes you will feel comfortable, but another person not feel comfortable. So, which means that is a range. And this range determined by anthropometric data, it can happen some products, it is designed for foreign people they are some people are huge right, taller, some people are shorter, some people on average some people are average is lesser more.

So, it depends upon even in India also you will see that people of different age groups have different heights, different weights. So, anthropometric data is different for different people, for male it different, for female it is different, right. So, now if you talk about anthropometric data, anthropometric lot of extensive work has been done by different faculties and professors.

And we should be thankful to them in different IIT's faculties have the extensive work they found the anthropometric data, their books is also available on in on anthropometric data book. The data which is there is you see in the image that the height is different for male and female. So, 5th percentile it is 67.3, for female is 58.9 and then for 50th percentile it is 68.3 and 63.2 respectively for male and female 95 percentile 72.6 and 67.4. So, which percentage do you take?

So, you should understand that depending upon the type of the user we are going to take different measurements of this. And if you see the eye as eye height and if you see the shoulder height again is different for different people male and female and also for 5th percentile 5th percentile and percentile.

So, most of you know what is percentile? Here is a 5th percentile is that ok, yeah, 95 percentile is 95 percentile over in a with respect to 100 percentile. So, 5th percentile is a is a

kind of average, but not actually average. So, in 5th percentile means a 50 only 5th 5th percentile person who are having lower height than them on an average.

So, 95 percentile is so 95 percentile people are having lower which means that these are higher height people more longer or taller people. So, which means that these are the things which are there in this. Now, depending upon the product which you are going to define you design, we are going to have an example of it, we are going to select the right kind of measurements, ok.

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So, design thinking is very important for industrial design. Here we are using new ideas, we are generating new products especially for new product development design thinking is very important and industrial design has much learned or should know about design thinking.

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Now we are going to see the design of this chair. As I told that this chair or any could have need to be having three things which are important, one is this functionality. So, chair (Refer Time: 26:46) is for sitting not only that for sitting for long time. It should be aesthetics it should look good looking actually good, ergonomics. So, it should be having ergonomics also. So, many of person sitting it should be sitting for long time.

Now, the question is that especially when you design the chair for Indian population should see anthropometric data. And so many data will be using what data should be used? Should I will use it for 95 percentile, 5th percentile or 50 percentile. So, any innovative designers will say I will make everything all the dimensions 50 percentile, nothing wrong in it, is fine.

But if you want to if you want to think little bit more, they will find out that the right approach is to analyze each of this in a tactical way and see what is exactly what should be

percentile for this. So, first thing is their dimension the height of the backrest. Height of the backrest should be for 5th percentile or 95 percent percentile.

So, take for example, if somebody even making it for 5th percentile then when 95 percentile person of height of 95 percentile of person is want to sit he will be having height and his backrest will lower. But if you design the backrest for 95 percentile data 95 percent data backrest will be higher and 5th percentile when you sitting you will be sitting and, but backrest will be higher.

So, which is more comfortable? The comfortable is that if you design for 95 percentile then both 5th percentile and 95 percentile person is can be comfortably sit. Now, coming to this height sitting height. Now, which one is more comfortable? Think, if you design for 95, 5th percentile person, then leg will be hanging for 5th percentile person, but if you design for 5th percentile person 95 percentile person what they will do? People either fold it this way or to expand it this way. So, which is comfortable?

So, which means that you need to design this one the height should be the measurement for 90, 5th percentile. Now, the chair sitting place this you can take for 50th percentile which means that both I mean almost all the average people are going to be comfortably sitting. So, and then not only that we have to see you know cushion is there and this cushions and this is curve.

So, these all these dimensions they will taken care of when you are designing a chair. So, it is extremely important that we are designing chairs or any product which are which you have to designing and take the right measurements which are available to us. Please go ahead and design products.

Thank you.