Ergonomics for beginners Industrial design Perspective
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Module No. # 05
Behavior and perception
Lecture No. # 25
Information Processing and Perception

Welcome to this 25th session of ergonomics for beginners industrial design perspective. In this current module is the module 5 behavior and perception. Under this module, the class number 25th that is information processing and perception and its some design relevancies.

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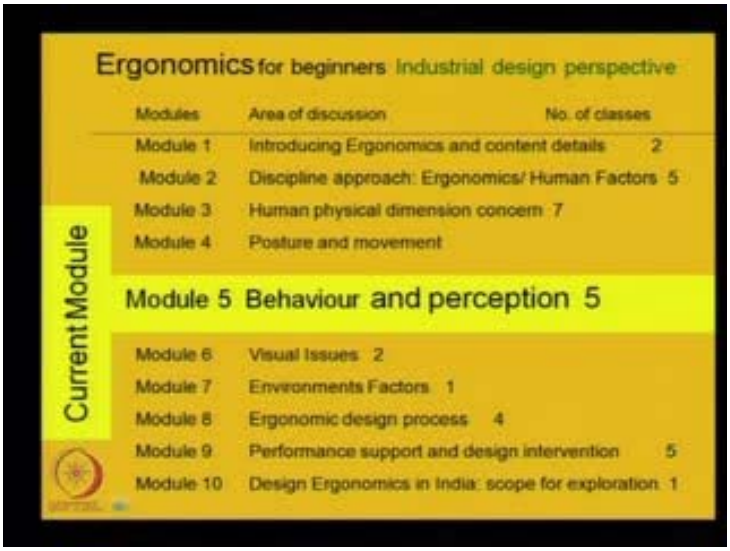

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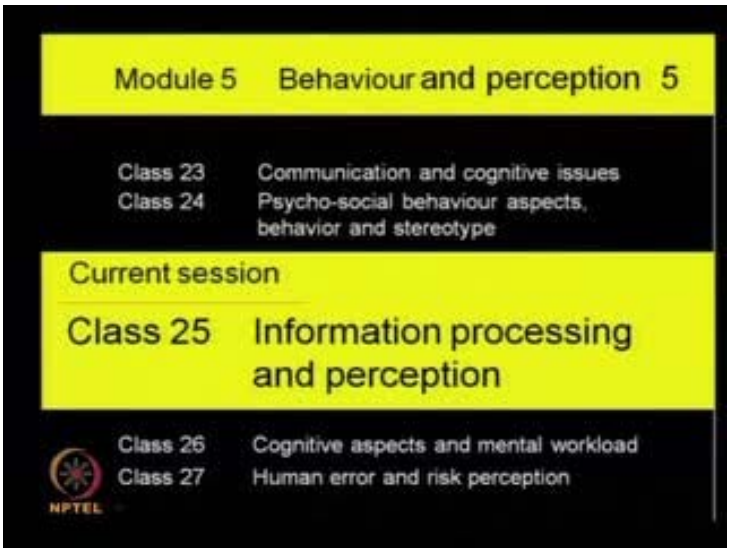

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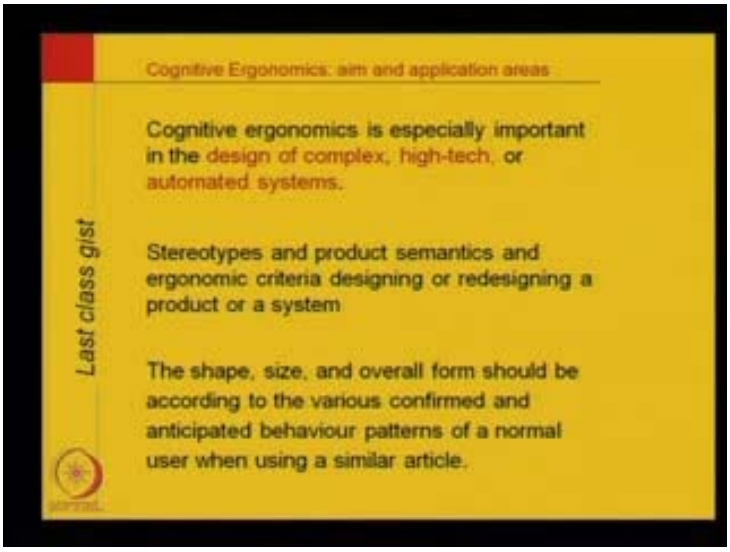

Now, last class just on this cognitive ergonomics, aim and application areas, under that we have discussed last time that cognitive ergonomics is especially important in the design of complex high tech or automated systems. The stereotypes and product semantics and ergonomic criteria designing or redesigning a product or a system, the shape, size and overall form, should be according to the various confirmed and anticipated behavior patterns of a normal user when using a similar article.

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We also discussed that the relation between sensation and feeling and the design appreciation. There, we should have linking the past experience while thinking for a new design. The psychological acceptance factor depends on some issues; that is, the product or component in any system and space thereby should speak out its usefulness and mode of use to their intended users; linking with users' basic instincts and past knowledge that is the semiotic application. In design, if we perform this then, the design will be well accepted and it will go for trustworthy feeling.

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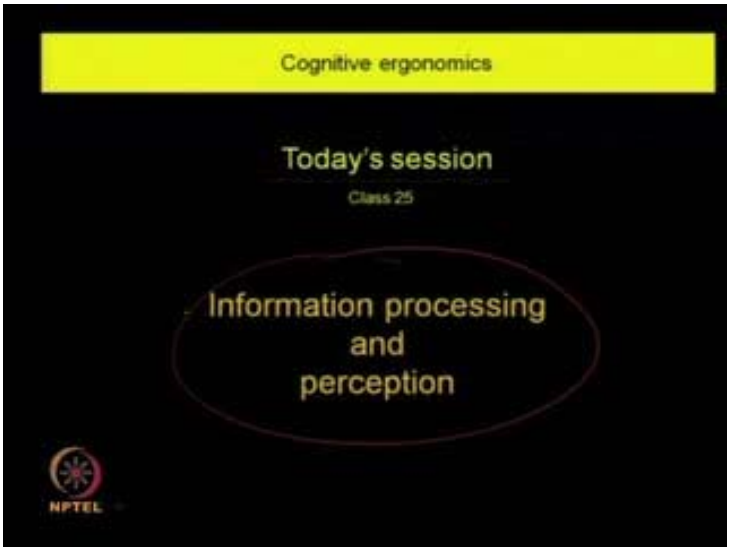

So, today is the cognitive ergonomics; that today's session class 25th is that the information processing and the perceptions and some psychological issues behind this.

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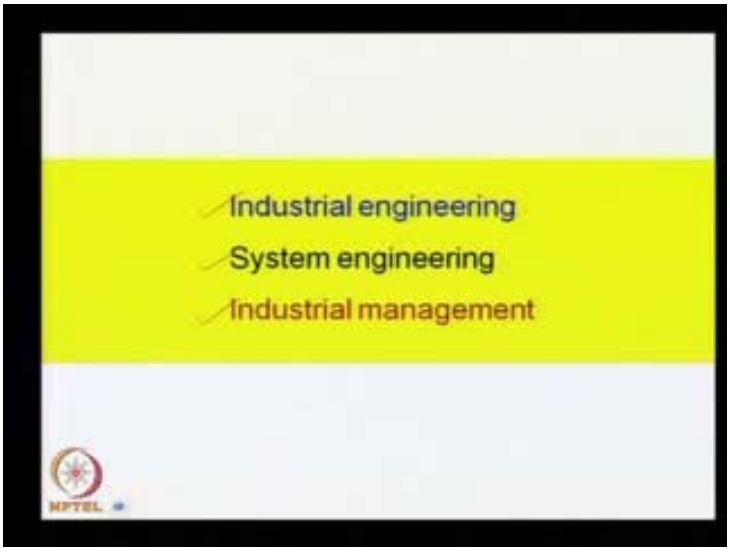

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Now, we will see this through: there is industrial engineering application system, engineering application and industrial management application. And, relevant to that now, for industrial engineering issues we can say that it is being used in, for designing jobs that is determining the most economic way to perform work. These most economic work ways it means that including human resources the setting performance standards

and benchmarks for quality, quantity and cost, designing and installing facilities, these issues are covered in these industrial engineering aspects.

Now, the system engineering involves the recognition; how we recognize different stimuli with its variations, intensity and the meaning behind it. The recognition, the appreciation of those things and integration of all aspects of an organization or a facility, these are the system engineering issues.

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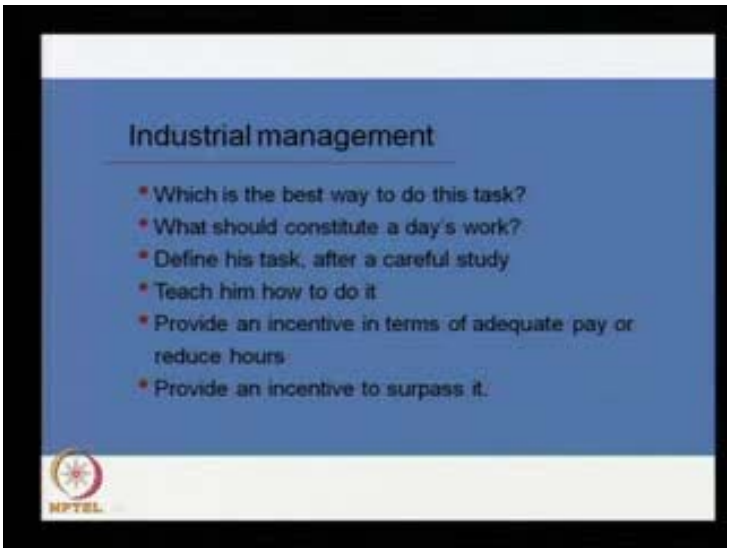

Now, the industrial management issues it covers that; which is the best way to do the task, so that no discomfort will be there. Yes, we can reduce the discomfort level either to be minimized like that; what should constitute a day's work is the limitations. define his task after a careful study means the compatibility match between the task requirement and the human resources teach him how to do it. means If the task requires some special attention then, with the existing information the person has, how he can best utilize that? How to use the new things? The information provides an incentive in terms of adequate pay or reduced hours; means, the motivating factors provide an incentive to surpass it. Means, there will be always positive motivating factors to accept those new things as a challenge; to achieve the goal. So, these issues are under the industrial management.

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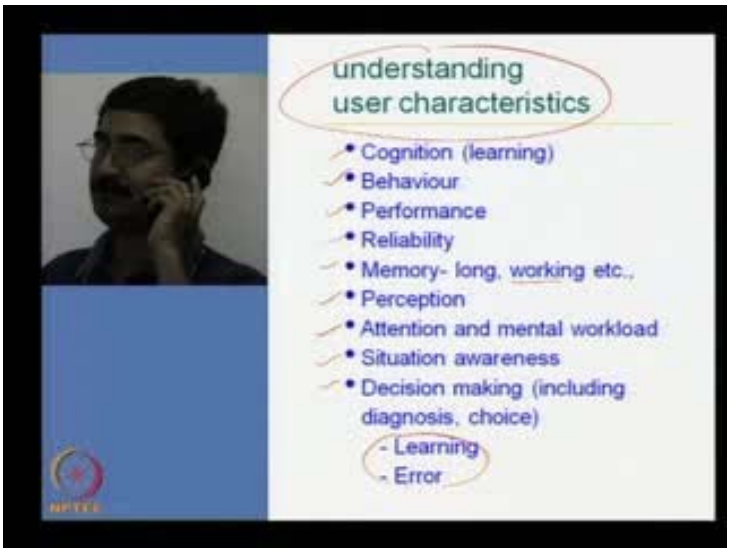

Now, we will see that all the things we are discussing, its basic aspect is that understanding users' characteristics. Now, this figure (Refer Slide Time: 06:42), the left hand corner of the slide, it says that the person is holding a mobile phone; so what are the information he should have in this mobile phone? Characteristics: the structure so that the man can feel a trust on this design, functionality, reliability, pleasure and finally, the trust value. So, for that we need to understand the users' characteristics; if it matches with the design features then, design will be well accepted.

What are the things we need to concern? There is cognition, the learning aspect. How man learns and what are the issues? The common behavior and specific to the context specific behavior, then performance reliability factors, the equipment's reliability factors, mechanical reliability to deliver the thing that the equipment is designed for; that and the reliability of the man; how is reacting on that memory? How much learning one person can memorize? That is long-term memory and working memory; long-term memory is that it retains in mind for longer time and when a new thing comes, new situation comes, it can be retrieved and the working memory is that while doing certain work at that time whatever what he is learning, he can go on repeating those works but, it may not retain in mind for longer time if he discontinues the task.

The perception after seeing the product or the area or the design; what the person, that user perceives. Attention and maintain mental workload situation, awareness, if when the

two things are there in different situations or same situation, what will be the behavior with that product? The decision-making including diagnosis and choice.

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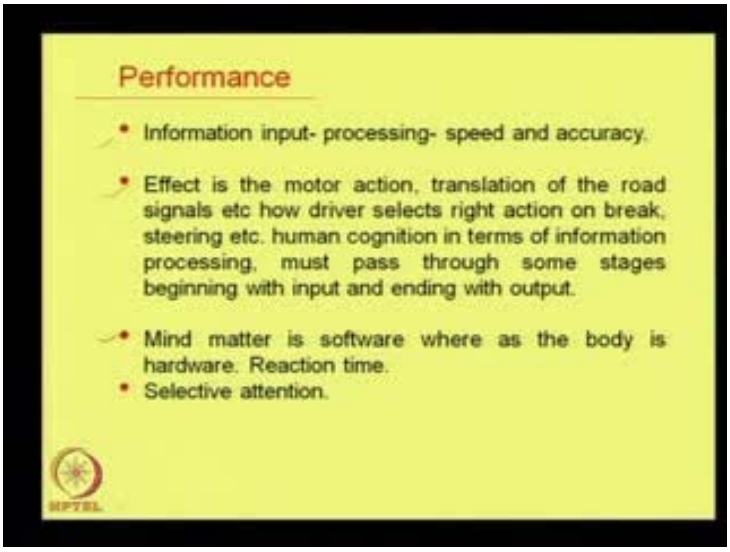

Here, the learning and error has a good listen learning issues and why people do errors and what are the possibilities of the errors? Now, with this we should see that what is the performance value? What is the performance? Performance is that information input processing speed and accuracy; this under linking for the performance.

Now effect is the motion action translation of the road signals, etcetera. How driver selects right action on brake, steering, etcetera. Human cognition in terms of information processing, must pass through some stages beginning with input and ending with output. This input maybe through different senses and output either from mental output or a motor output that is with some activities like that.

Mind matter is the software whereas, the body is hardware. Now, things comes, reaction time; the reaction time is that suppose, something is coming to us, to me and that information when it comes to me to judge or something and then, react on that so that time is the reaction time.

So, if we can reduce this reaction time then obviously, the design is better. So, that as quickly we can recognize what the things and how to act upon that, those things that is the reaction and the selective attention. Now, there are many items are there or many

information are there; but, as I wish to have, I can select some of the information. Selective selection like in a railway station, many audio inputs are there like, train departure and arrival; but I am not listening all the things. It is a masking effect but when the train number and what train name matches with my requirement that I want to board, I give my selective attention to that information, that announcement.

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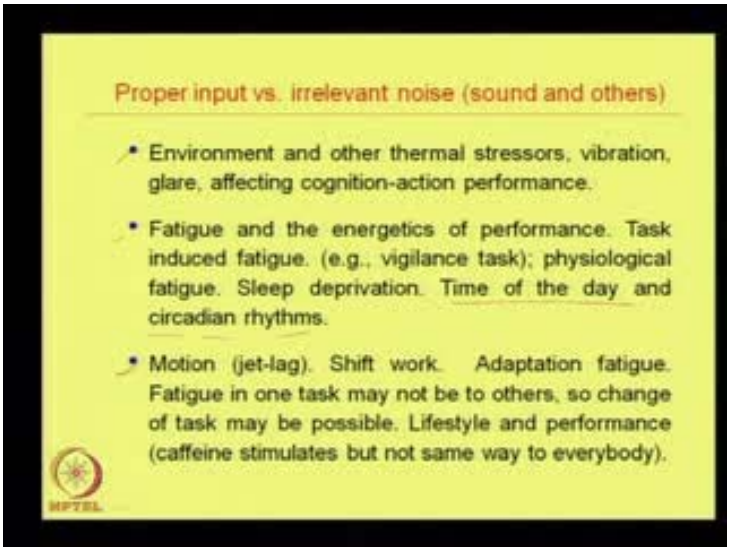

So these specific facilities we have that is selective attention. Now, what are the factors tells me or guides me for this selective attention? That, those are the cognitive ergonomics issues that we would like to discuss in this. Now, proper input versus irrelevant noise: that is, sound and others mean the information. Now, environment and other thermal stressors, vibration, glare affecting cognition, action, performance, these issues and other issues are the fatigue and the energetics of performance in this relation. So, task induced fatigue that is, vigilance, task, physiological fatigue, sleep deprivation, time of the day and circadian rhythms. So, these also affects the performance like when we meet some people at the morning or in a day time, the way we can receive those people at the time while going to bed at the night. If the same people come then I may not receive them in the same way because, the time of the day and the circadian rhythm does not allow me to perform throughout the whole the same way to receive the information and to act upon that.

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So, accordingly if we make design then it will be well accepted. Now, the motion that is jet lag, shift work, adaption of fatigue. Fatigue in one task, may not be to others. So, change of task maybe possible; lifestyle and performance; like caffeine stimulates but, not same way to everybody. So, there are individual variations. Now, if we understand these individual variations and a group specific behavior pattern that is stereotype and accordingly, if we select the design features then it will be well accepted.

Now, the cognitive skill and physical skill: this cognitive skill and physical skill it is predominated mode of activity and a judgment on the level of skill will be made on the basis of the judged quality of solution to the problem. Like, goal keeper's task is a combination of cognitive decision-making and planning which will be supported by the motor skill; that is, coordinated action. Training is necessary. Stress arousal and performance relation. We should understand now role of motivation and expectancy of success, value of success, casual attributes and goal-setting. These are the some issues that we need to consider.

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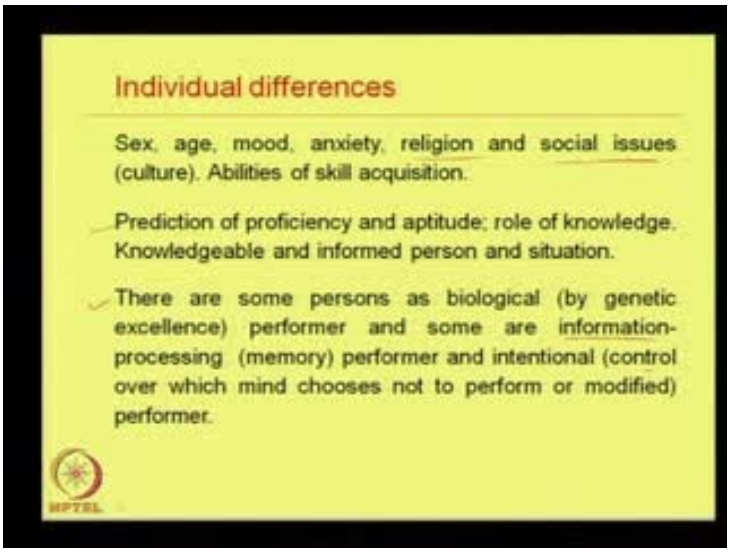

Now, individual differences like sex, age, mood, anxiety, religion and social issues that is culture, it has relation with the performance attributes of skill acquisition; like in certain cases the black color is not auspicious; in some group it is auspicious. Also, now for those it is not auspicious, in that case, if we give a design with that color they may not like it. So, this is the social issues and religious issues kind of thing.

Now, the prediction of proficiency and aptitude: the role of knowledge is there. If I do not know this matter then, how I can appreciate it? So, we have to judge the users groups capabilities; then accordingly, if we give the things then it will be well accepted. Otherwise, due to that lack of knowledge it may not be used. The knowledgeable and informed person and situation is required to be considered. There are some persons as biological by genetic excellence performer and some are information processing memory performer. Some people can do better mathematics calculations and some people can do field work with the physical activities.

So, now if we want to develop a certain product that a memorable, if the person information processing performer that is, memory related man, for him then it may not be suitable for a person who does the physical skill work like that. But, in certain cases we have to make a balance like, why do we make a mobile telephone? It will be equally used by information processing performer as well as biological excellence performer that is a physical person.

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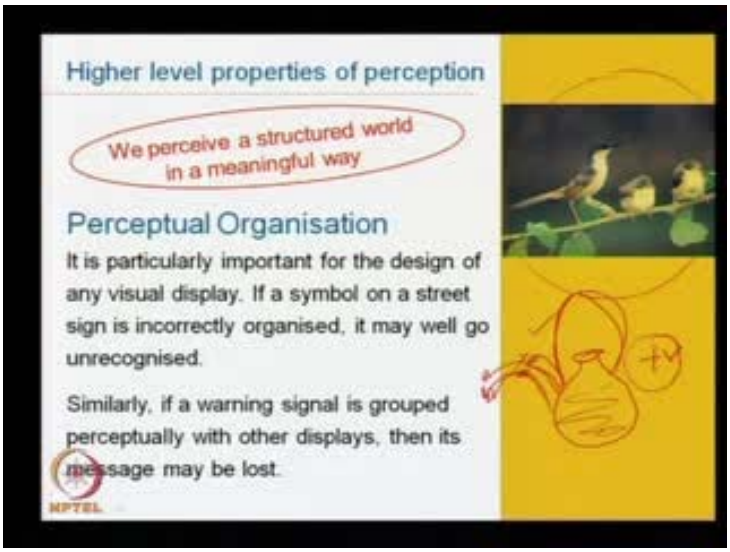

We have to make a judgment for whom we are designing the products; an intentional that is control over which mind chooses not to perform; or modified: that type of performer we also need to consider. Now, we will see that higher level properties of perception.

Now, we perceive a structured world in a meaningful way. Whatever we see we try to understand some meaning behind it. So, that can be used for some other ways. The perceptual organization: it is particularly important for the design of any visual display. If a symbol on a street sign is incorrectly organized, it may well go unrecognized. Similarly, if a warning signal is grouped perceptually with other displays then its message maybe lost.

In this case, we can cite some examples. Like, in this figure, in the right hand side figure (Refer Slide Time: 19:43), 3 birds are sitting. From a distance if we see them, we may miss these birds but, if any one bird they start moving their wings or they start jumping or flying like that then it draws our attention. So, in a harmonious group of many items if something is different then it draws our attention. So, accordingly in a panel if there are many indicator lamps they are of some colors but, if to indicate some specific function if a specific indicator glows little higher intensity or it is flickers, it draws our attention; so that has to be practiced.

Another thing; some unusual appearances also draws our attention like, suppose in a marketplace in the morning; when people go to that marketplace in previous night there

was a storm and rain. So, in a shop a shopkeeper - he suddenly noticed that many people are entering into his shop in comparison to other days and whoever is entering they are just inquiring whether there was any damage or something due to the storm. So, after certain period of time that shopkeeper thought that, what is the matter? Why they are asking all the things and why it happens? He came out of his shop and he saw that the signboard at that shop it is upside down due to the storm. So, all other signboards in other shops almost remained as it was - normal condition.

So the people whoever visiting that marketplace they found that, why it has done. Perhaps, so the inquisitiveness to a different met of a thing. So, this matter if we can use then it will be useful to draw your attention but, sometimes what has happened, some false items are also provided in it to draw the attention. Like, you know that in some advertisement it is said that a so the double benefit of some insurance policy. So, what they do? what Just like this: suppose, this is a pot and this is an open mouth (Refer Slide Time: 22:24). So, when you tilt it then water should come from here. Now, they said that double mouth double spout. So, what has happened if you do it? Then, double water should come out; double amount of water. The thing is that when it is full, both can be operative. When the content is less then, if you do it only the lower one will be active; it may not be active.

But, when you see the figure, this positive effect and in not possible effect, both give a combined feeling to you so that, you are attracted to see this advertisement. This maybe, possible, that type of things. Sometimes, what is happened? Some thought like that. If I want to write a passage at work advertisement there if I say that ‘keep your luggage ready’. Now, if we see that keep your luggage ready, people may not see it properly but, if I write it ‘k double e p y o u r l g g a g r a c h’, then people see (Refer Slide Time: 24:00). People are very much intelligent to recognize the mistakes. So, while seeing this they will see that whether it is a mistake and the rest all are good words, no problem. So then, they will try to understand, recognize what it is then. Actually, they will find out this thing; so this is to draw attention. So, similar type of activities may be used.

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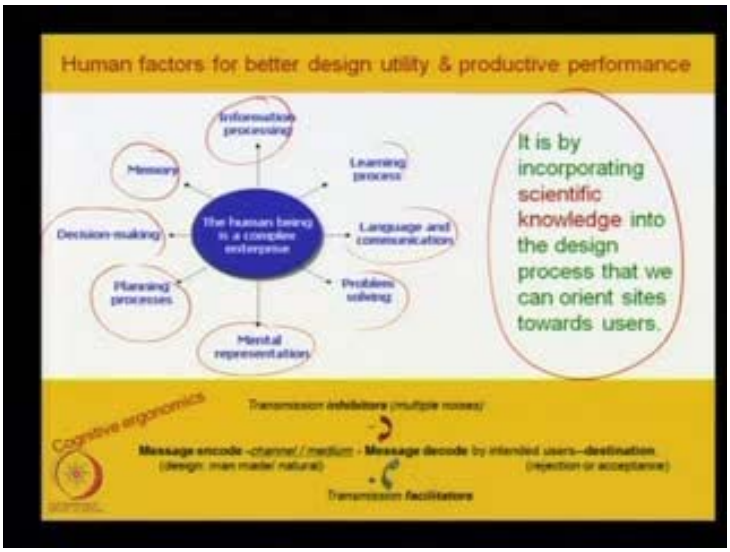

Human factors for better design utility and productive performance: now here, the human being is complex enterprise where information processing, learning process, language and communication, problem solving, mental representation, planning process, decision-making, memory, etcetera, all are related. It is by incorporating scientific knowledge into the design process that we can orient sites towards users; so those things we need to consider.

The cognitive ergonomics: that earlier also we said that message encode in design may man-made or natural through various channels and medium. The message should go to the people there will be message decode will be decoded by the intended users and destination. It will go then for people can reject the information or they accept that information. Here, the transmitter facilitators and transmitter inhibitors are there to make the balance.

Now, which one is more, depending on that the information flows. Like, one thing we can say that when we enter into a shop floor or a manufactory or a school, there is an in entrance. It is mentioned that a single word that,' do not spit'; few days people may follow this information but, if it retains there for a longer time then, it becomes adopted. People will try to forget that signage and people will start again spitting in the corner or building corners. So, these are the some aspects we need to consider.

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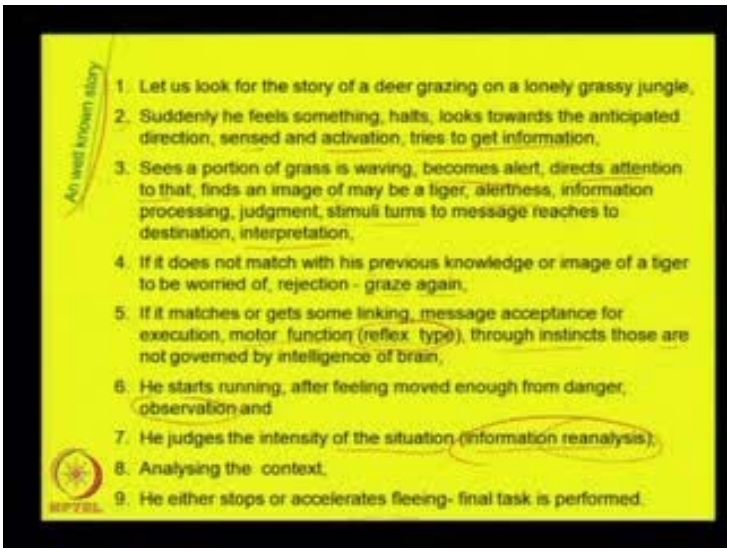

Now we will see this aspect; how the information goes inside? Judgment comes and the activity starts. If we see through a well-known story, the story goes like that. Let us look for a story of a deer grazing on a lonely grassy jungle. Suddenly, he feels something he halts. He stops his eating grass, looks towards the anticipated direction, something has come to him. He tries to look where from, where the information is coming; sensed - then activation means his ears become straight; tries to get information. Next, it sees a portion of grass is waving in front of him; if there is a grassland, a portion of grass is just waving becomes alert; directs attention to that; finds an image of may be a tiger; some euro scratches in the green grassland then, alertness, information processing starts judgment stimulate terms to message reaches to destination that is the mind and then interpretation starts what it could be.

If this information does not match with his previous knowledge or image of a tiger to be worried of, if it does not match rejection of that information and he will gaze again. If it matches or gets some linking message, acceptance for execution means, if it matches from that yellow feeling and something in that grassland, if it matches with some tiger he has seen earlier then, message acceptance for execution. Motor function: this is the reflex type; but if it matches or some kind of linking then he starts running. That is a reflex type through instincts; those are not governed by intelligence of brain. He is not checking that whether it is a tiger or something; he just gets a feeling that it may be something that is unusual, dangerous, he starts running little bit; so, this is the reflex type of activities.

Then he starts running; after feeling moved enough from danger he stops or while running he turns his head to reconfirm. The information - that is the observation and he judges the intensity of the situation that is, information reanalysis, analyzing the context fully, he either stops or accelerates. Feeling being final task is performed means, if while the reanalyzing - the trip reanalysis of the information while turning head, if he finds that it is not a tiger then, he stops. Or, if it is a tiger then he will accelerate his running; so this is the final task performed.

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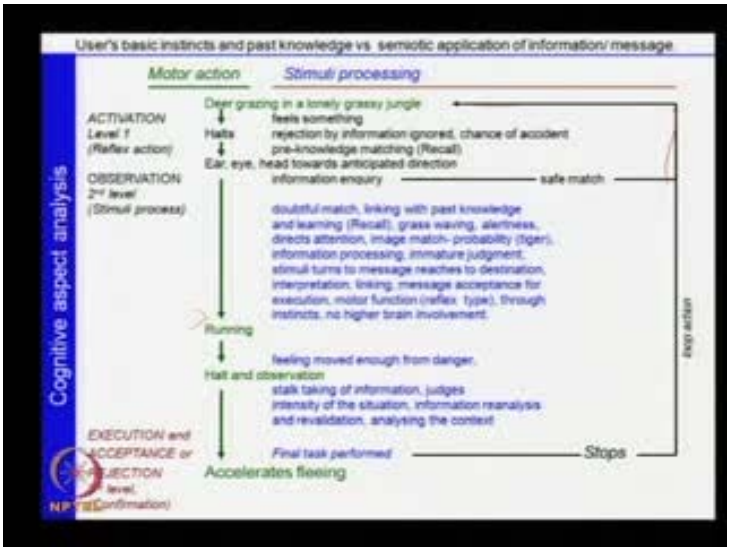

In this stage, many stop many pages of information processing has started. Now, if we try to analyze this then, let us see how it is being analyzed now, with the cognitive aspect analysis, user's basic instincts and past knowledge versus semiotic application of information and message; the motor action and stimuli processing.

So, first deer grazing in a lonely grassy jungle; if he feels something, rejection by information ignored, chance of accident, pre knowledge matching - that is a recall motor action is a halt and this is the stimuli process. Then, motor action: ear, eye, head, towards anticipated direction. It moves information; inquiry starts if there is a safe match. Then he will if it is safe match; means it is not a tiger-type of feeling, then he will stop it again and he will start grazing again.

But if it matches or something like that doubtful match those information linking with past knowledge and learning that is a recall grass waving alertness directs attention

image match probably, a tiger information processing immature judgment stimuli turns to message reaches to destination interpretation linking message acceptance for execution motor function that is reflex type through instincts no higher bend involved in this case if it is then motor action is that running in runaway or further while running feeling moved enough from danger this is the stimuli processing halt and observation

So here, what while halting and what he is observing and what it is going on that stock taking of information judges intensity of the situation information reanalysis and revalidation analysis of context then if you the final task perform accelerates feeling or if it is safe match then stops and through loop action it goes again or the grazing

So in this case there are three levels of activation. There is a activation level 1; this is the reflex action of this type of task. Second level is that observation. Second level of that is a stimuli process; in this case, a stimuli process and after that, execution and acceptance or rejection. The third level of a confirmation; this whole activity is the cognitive aspect of analysis issues. So, where we are getting confirmed information, how much information that accelerates us to reach to the final stage, the minimum time we provide for this design will be better accepted and will be safe and reliable.

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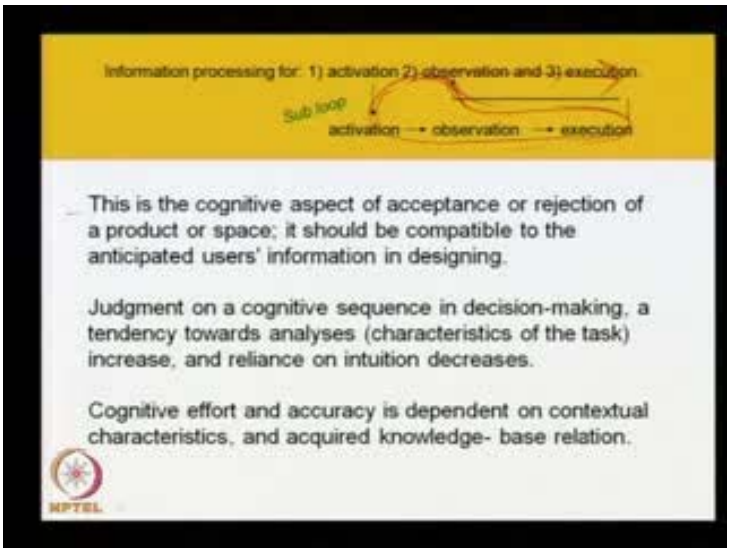

Information processing for first activation, then observation, then execution and sub loops are there. That activation, again observation, execution and it goes to observation.

So, there are many sub loops are there while going for a specific final function then it goes to the section.

This is the cognitive aspect of acceptance or rejection of a product or space design. It should be compatible to the anticipated user's information in designing judgment on a cognitive sequence in decision-making. A tendency towards analyses, characteristics of the task, increase and reliance on intuition decreases.

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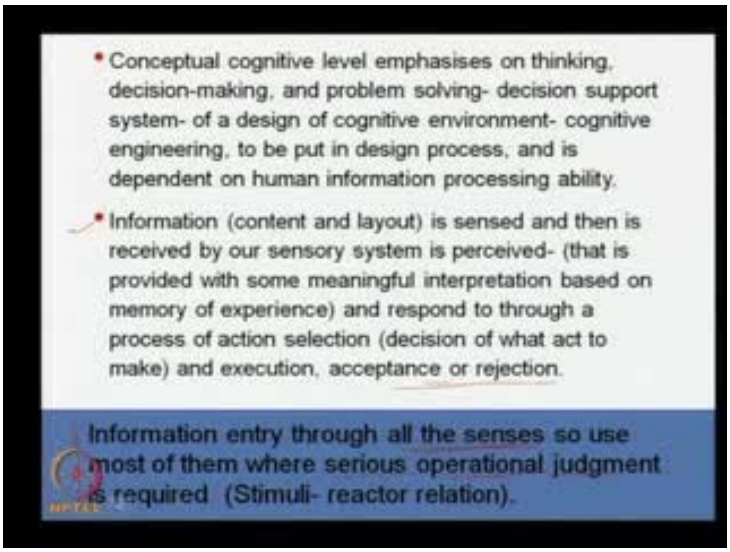

Cognitive effort and accuracy is dependent on contextual characteristics and acquired knowledge based relation; the conceptual cognitive level emphasizes on thinking, decision-making and problem solving, decision support system of a design of cognitive environment, cognitive engineering, to be put in design process and is dependent on human information processing ability.

The information that is, a content and layout of the information, is sensed and then is received by our sensory system is perceived; that is provided with some meaningful interpretation based on memory of experience and responds to through a process of action selection that is, decision of what act to make and execution and acts. Finally, acceptance or rejection will be there. So, information entry through all the senses - so use most of them where serious operational judgment is required; that is the stimuli reactor relation.

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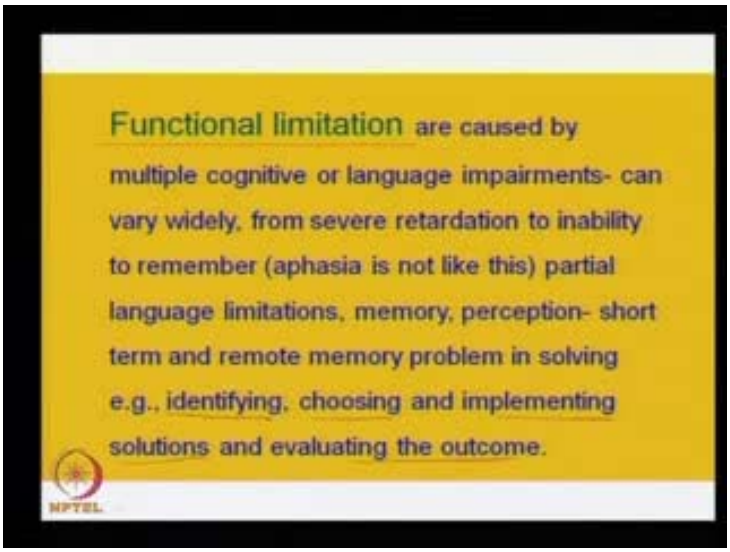

Now functional limitation are is caused by multiple cognitive and language impairments that can vary widely from severe retardation to inability to remember that is, aphasia is not like this; means, while speaking or while doing something I suddenly forget something and then with some clue I can regain or recall those information; or I can connect that linking that is the aphasia but, it is not like that. So, that partial language limitations, memory, perception - short term and remote memory problem in solving that as for example, identifying, choosing and implementing solutions and evaluating the outcome.

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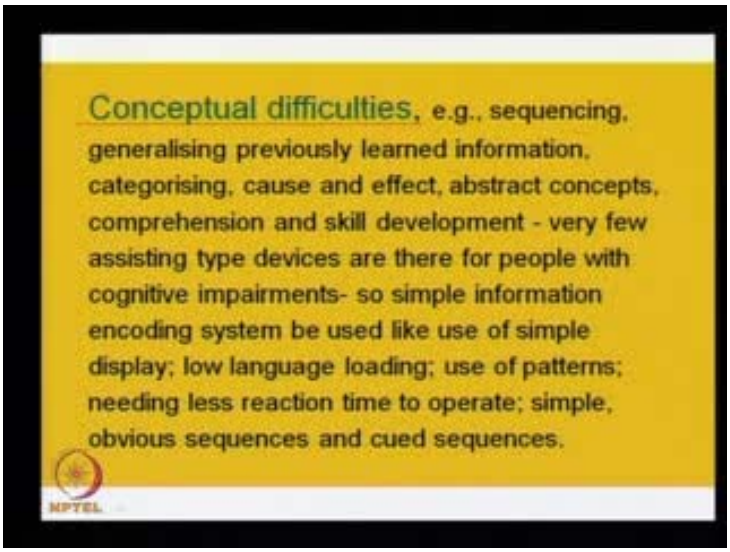

Now conceptual difficulties as per example: sequencing, generalizing previously learned information, categorizing, cause and effect, abstract concepts comprehension and skill development - very few assisting type devices are there for people with cognitive impairments. So, simple information encoding system be used like, use of simple displays, low language loading, use of patterns so that, people can recognize easily; needing less reaction time to operate; simple obvious sequences and cued sequences. If we use all those things in a design item as basic characteristics, while using the design or choosing the design, would be beneficial and will be useful for us.

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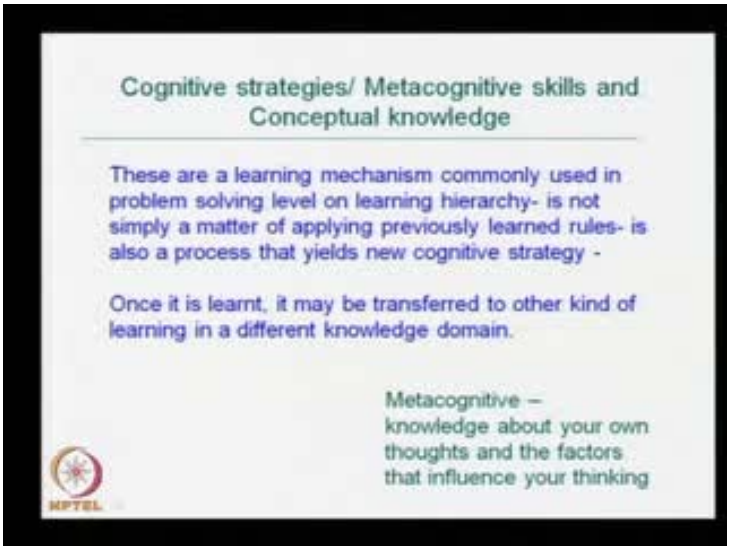

Now cognitive strategies and the metacognitive skill and conceptual knowledge; what does it mean? These are learning mechanism commonly used in problem solving level on learning hierarchy - is not simply a matter of applying previously learned rules; is also a process that yields new cognitive strategy. Once it is learnt, it may be transferred to other kind of learning in a different knowledge domain. So, this is the cognitive strategy and if we use this then it would be obviously beneficial while accepting a design

Now the metacognitive means the knowledge of about your own thoughts and the factors that influences your thinking. If these aspects are used while selecting design criterias then obviously, it will be accepted because it matches; the compatible matches are there. So, design will be useful now design relevant aspects for information processes capabilities.

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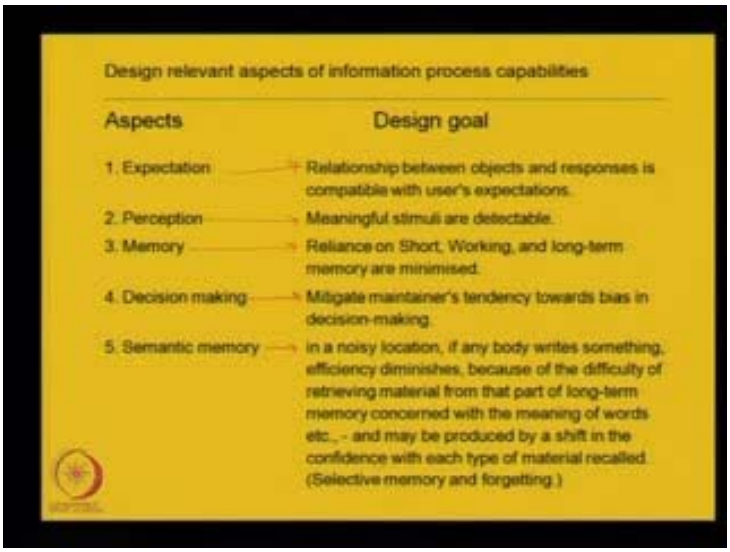

Now here, in this left hand side, some aspects, five aspects and the design goals are in right side. Now, the aspect is one expectation; what it is? The relationship between objects and responses is compatible with users' expectation. Now, perception: meaningful stimuli are detectable. Memory: reliance on short, working and long-term memory are minimized. Decision-making: that is, mitigate maintainer's tendency towards bias in decision-making. Then, semantic memory: in a noisy location, if anybody writes something, efficiency diminishes, because of the difficulty of retrieving material from that part of long-term memory concerned with the meaning of words, etcetera and may be produced by a shift in the confidence with each type of material recalled, like that is the selective memory and forgetting issues.

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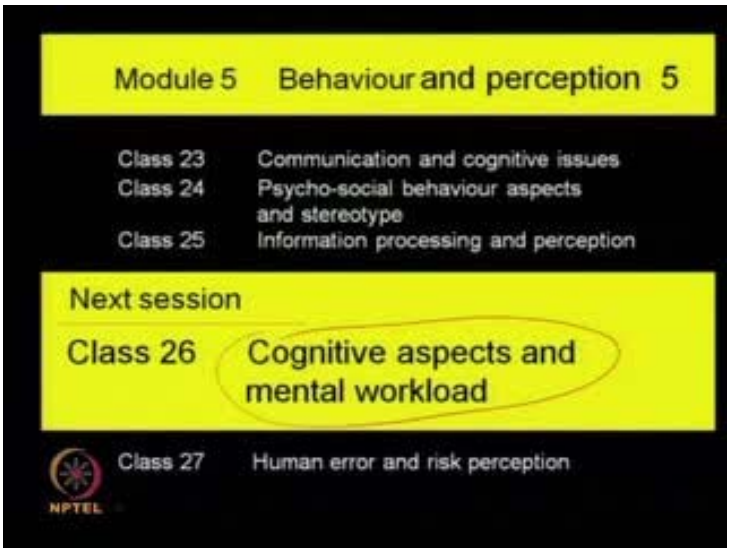

So, with this we are ending today's information processing and perception basics. So, the next session class number 26, we will discuss the cognitive aspects and mental workload where we will be elaborately discussing the memory matter and how we select the selective linking's and etcetera. That we will discuss in next class. So, for today this is the course material; so for next day, will see how it is direct design applications are there.

Thank you very much.