Human Factors Engineering

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Lecture - 21
Ergonomic Problems in Computer Workstations, Design Elements of Computer Workstation

The dear students, during this week we are going to discuss a very important topic called Ergonomic Design of Computer Workstations.

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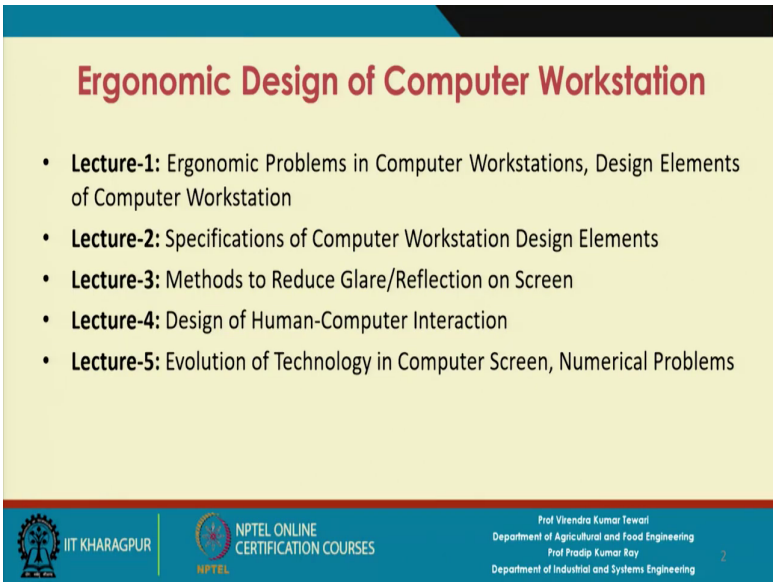

So, as you are aware that computer workstation, in simple language computers are being used in almost at all workplaces these days. For the last 30 or 40 years there has been widespread use of the computers at almost all the workplaces. Whether it is a closed workspace or open workspace, or the open yard, everywhere, even in construction sites you will find that the that the computers are being used.

So, when we talk about the computer related system, we use a term called computer workstation. Previously we used to call it the VDT workstations, visual display terminal. But today it is replaced with the term called computer workstations.

So, you come across the different types of or designs of computer workstations. Now, our focus is on ergonomic design. Hence you have to justify or you have to assess the design of a computer workstation from ergonomics and human factors perspective and in today's context.

The ergonomic design of the computer workstation has become a challenging assignment. It is a very complex issue.

So, we will try to highlight all the important design related issues design related the specifications of computer workstations, we will thoroughly study and assess all these the specifications and then, ultimately, we will propose the specifications of a given computer workstation from the human computer interface perspective.

Now, during the 5th week the lecture sessions, so we will have the 5 lectures:

Lecture-1: Ergonomic Problems in Computer Workstations, Design Elements of Computer Workstation.

Lecture-2: Specifications of Computer Workstation Design Elements

Lecture-3: Methods to Reduce Glare/Reflection on Screen.

Lecture-4: Design of Human-Computer Interaction.

Lecture-5: Evolution of Technology in Computer Screen, Numerical Problems.

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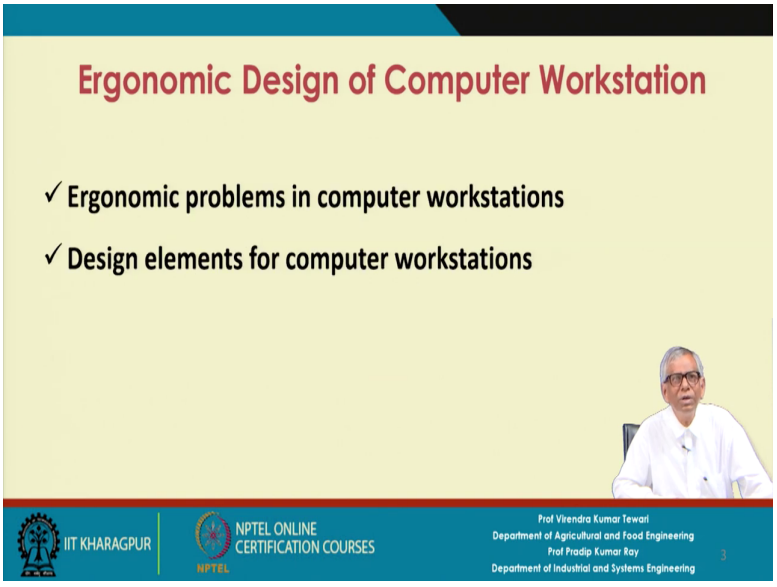

Now, in the next half an hour or so, I will be discussing the two important issues; the first one is the ergonomic problems in computer workstations and then we will the discuss the design elements for computer workstations.

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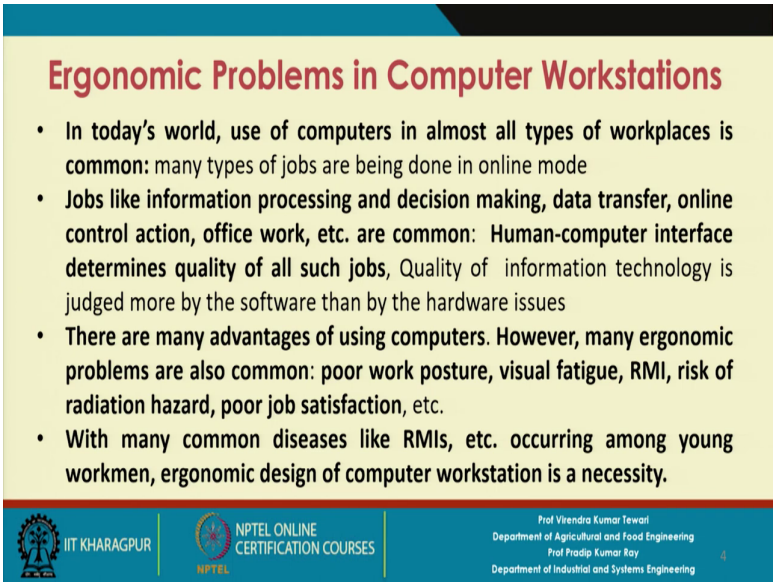

In today's world, use of computers in almost all types of workplaces is common, in many types of jobs are being done in online mode

Jobs like information processing and decision making, data transfer, online control action, office work, etc. are common. Human-computer interface determines quality of all such jobs, Quality of information technology is judged more by the software than by the hardware issues

There are many advantages of using computers. However, many ergonomic problems are also common: poor work posture, visual fatigue, RMI, risk of radiation hazard, poor job satisfaction, etc.

With many common diseases like RMIs, etc. occurring among young workmen, ergonomic design of computer workstation is a necessity.

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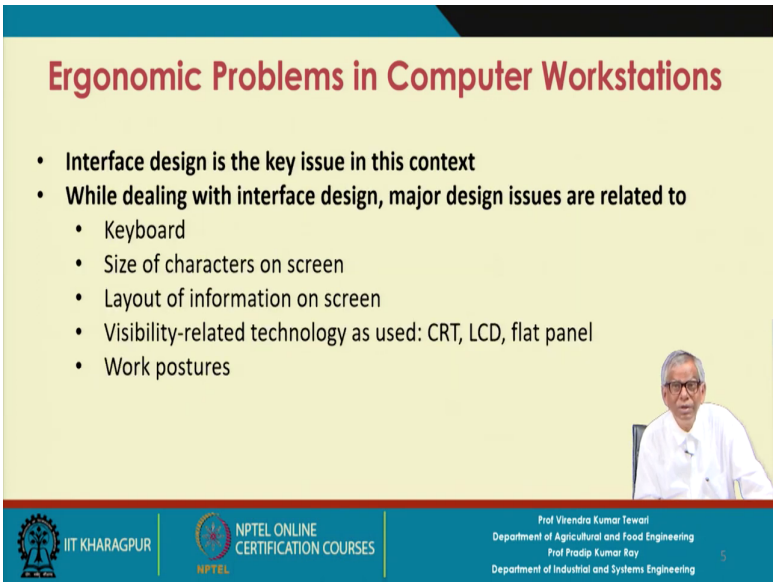

Now, as I have already mentioned that the persons are working on the computer. So; the interface design is the main issue. While dealing with interface design major design issues are related keyboard, size of characters on screen, layout of information on screen, visibility-related technology as used: CRT, LCD, flat panel and work postures.

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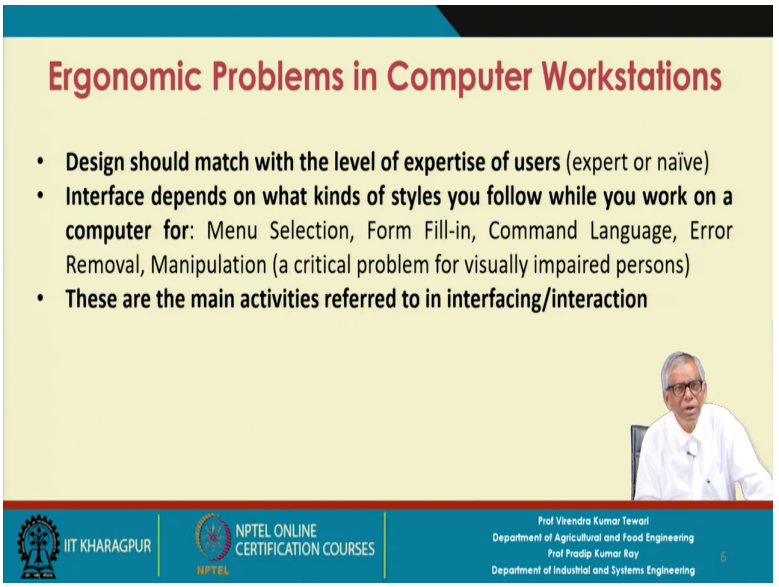

Design should match with the level of expertise of users (expert or naive). Interface depends on what kinds of styles you follow while you work on a computer for: Menu Selection, Form

Fill-in, Command Language, Error Removal, Manipulation (a critical problem for visually impaired persons). These are the main activities referred to in interfacing/interaction.

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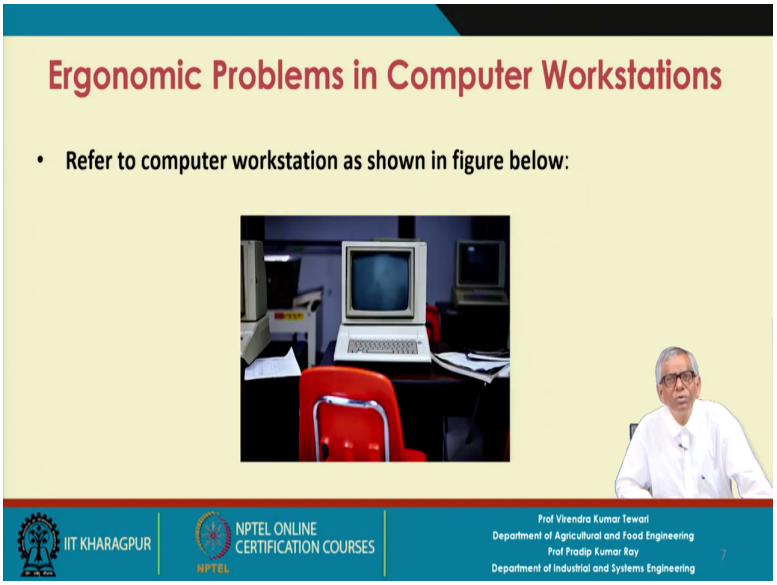

And one of the important issues you must keep in mind, is the usability, there is a term referred to as usability.

In a given figure, you can see the typical computer workstation. So, the computer is the placed on a table. And, then in front of the table you have a chair. The person will be there and, the person will have a sitting posture. So, majority of the cases we will find that the person is in sitting posture. But there are also cases where person will be the interacting with the computer in the standing postures.

So, related to the sitting posture, and the person is interacting with the computers, now you need to identify the design elements.

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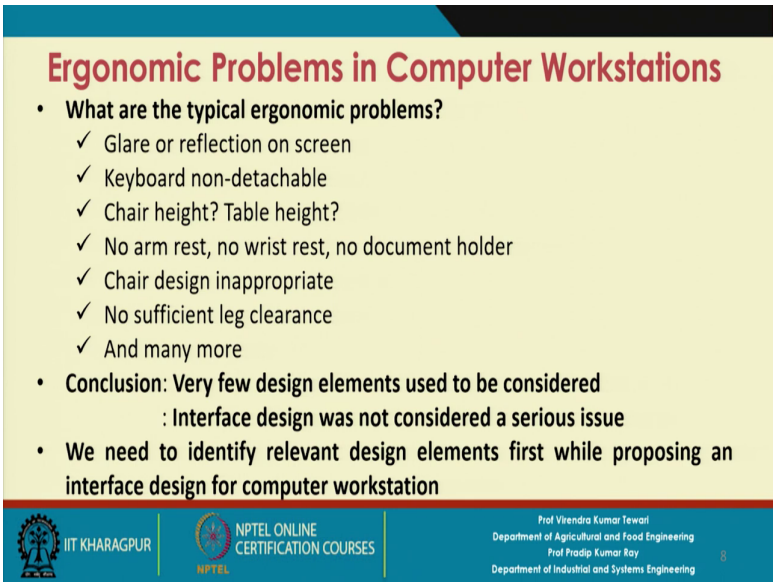

So, with a sitting posture of a person and interacting with the computer you have to identify the design elements and also there are typical ergonomic problems. Before, you identify these design elements and you propose the specifications of this design element in such a way that majority of these ergonomic problems are addressed. What are the typical ergonomic problems? Some problems are mentioned below

A. Glare or reflection on screen

B. Keyboard non-detachable

C. Chair height? Table height?

D. No arm rest, no wrist rest, no document holder

E. Chair design inappropriate

F. No sufficient leg clearance etc.

Conclusion are (a)Very few design elements used to be considered, (b) Interface design was not considered a serious issue.

We need to identify relevant design elements first while proposing an interface design for computer workstation

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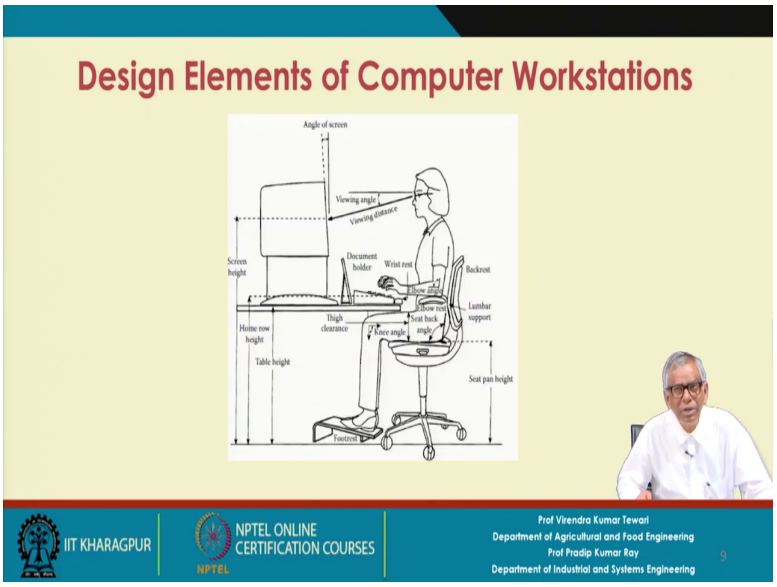

So, let us identify what are those design elements. Look at this particular figure, all the important design elements are relevant and the design elements we have identified, like angle of screen, viewing angle, viewing distance, seat back angle, the screen height etc. all these details are here. The table height as you have noticed that all other the design elements. These design elements are essentially supporting the anthropometry of the human who is interacting with the computer.

So, you determine the values of all these design elements or you determine the specifications of all these design elements in such a way, that those design elements or those specifications fit with the anthropometry of the person concerned. So, that should be your goal.

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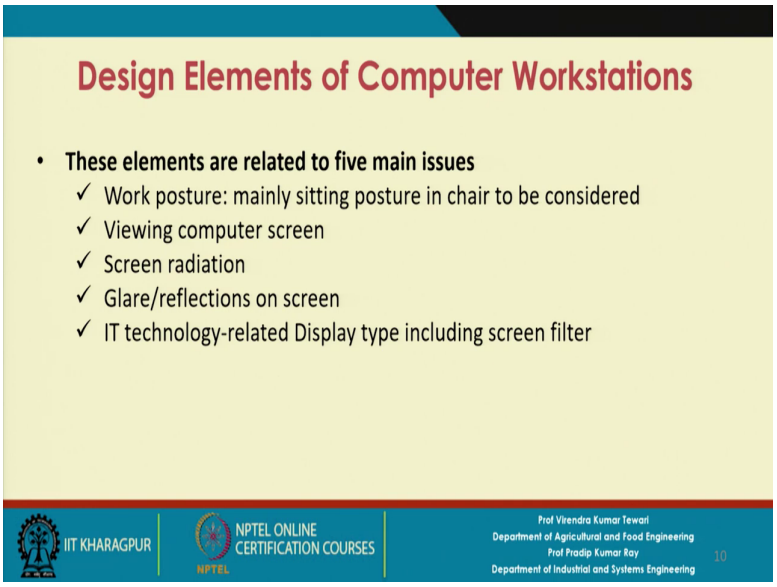

Now, these elements are related to five main issues. First one is related to the work posture mainly sitting posture in chair to be considered. Second one is viewing computer screen right. So, that is a must for interfacing that means, the visibility should be at the highest level.

Third one is screen radiation which should not be hazardous, Previously, many people used to say that this is a serious problem. But today, it has been conclusively proved that the radiation hazard is not at all a problem for at the computer workstations. Fourth one is Glare reflections on screen and last one is IT technology related display type including screen filter.

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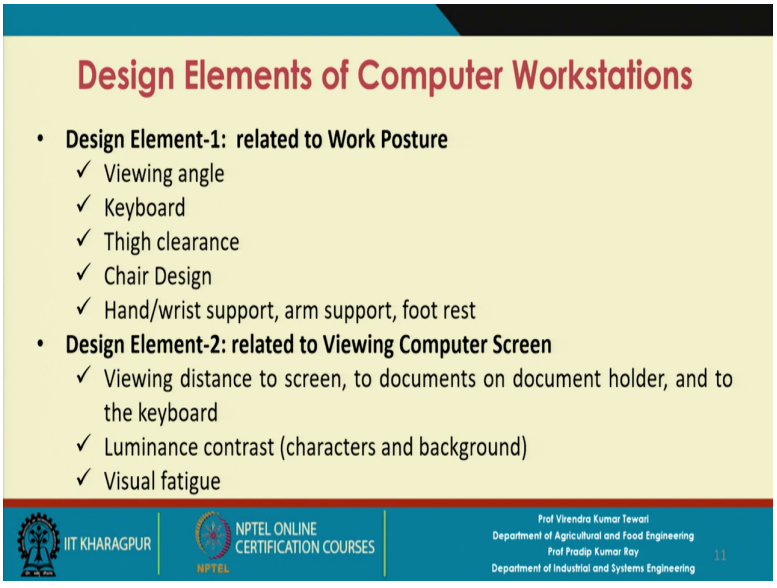

So, let me just highlight say the sub-elements related to each element.

Design Element-1: related to Work Posture which involves viewing angle, keyboard, thigh clearance, chair design, hand/wrist support, arm support, foot rest

Design Element-2: related to Viewing Computer Screen which includes viewing distance to screen, to documents on document holder, and to the keyboard, luminance contrast (characters and background), visual fatigue.

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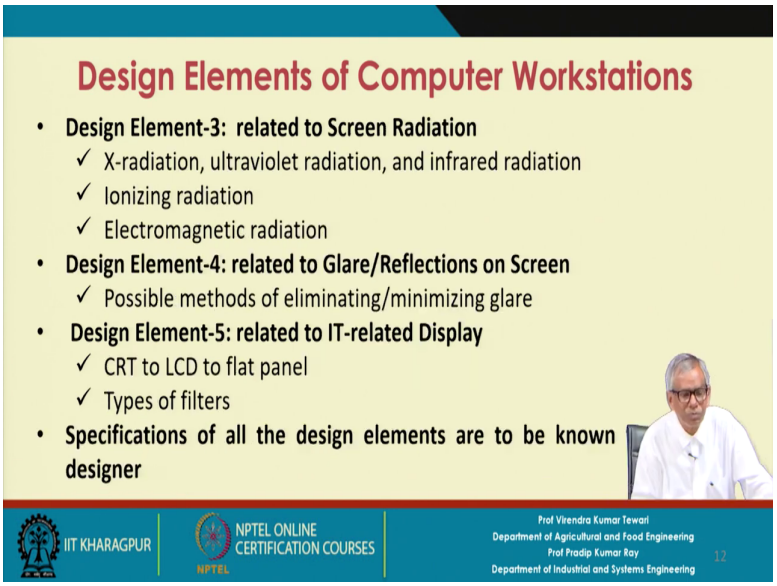

Design Element-3: related to Screen Radiation and 3 kinds of radiations are: 1. X-radiation, ultraviolet radiation, and infrared radiation, 2. Ionizing radiation, 3. Electromagnetic radiation

Design Element-4: related to Glare/Reflections on Screen, this is a very common problem, possible methods of eliminating or minimizing glare in a particular work environment.

Design Element-5: related to IT-related Display involves CRT to LCD to flat panel and types of filters

Specifications of all the design elements are to be known to interface designer

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