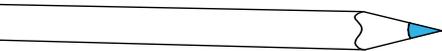


Online training course on design, of human-centred workplaces Pilot course

Learning guide



INDEX

1. INTRODUCTION	3
2. OBJECTIVES	3
3. PILOT COURSE CONTENTS	4
5. METHODOLOGY	14
6. RESOURCES	15
7. TEACHING STAFF	17
8. ASSESSMENT	18
9. CERTIFICATE	18

1. INTRODUCTION

Welcome to the “**Online training course on design, of human-centred workplaces**” - **Pilot Course**, which will take place from **March 2, 2020** to **May 27, 2020**.

Before beginning the training, we recommend reading carefully the following **Learning guide**. This guide is intended to be a useful tool for the student because it collects all the information required to have a global vision of the course and the context in which the teaching-learning process will be developed.

We hope that you will take full advantage of this approach to **e-learning (online)**.

Keep in mind that **studying online** does not only involve downloading or printing materials to study offline, but taking advantage of all the possibilities provided by the Information and Communication Technologies (ICT).

It is essential that trainees know that they have greater freedom and responsibility in their training, which involves organizing their learning pace, doing the planned activities and using the different tools available to communicate with the teaching team and engage with other participating classmates.

2. OBJECTIVES

Human-centred manufacturing is one of the researches and innovation priorities of the European Factories of the Future Research Association (EFFRA). The workplaces of the future will give much more importance to human knowledge, skills and cultural background, in particular through life-long learning and training.

Human-centred workplaces not only remain essential in the pursuit of reduced occupational and work-related diseases and injuries, and absenteeism, but they will also become increasingly critical to ensure the flexibility, agility, and competitiveness that will be imposed on future manufacturing operations.

The continuous intensification of interactions between technology and human operators raises complex safety and efficiency problems that, to a great extent remain unsuitably addressed. This is partly due to their highly context specific characteristics, which challenge many standard and well-established approaches. In this context, the cooperation between ergonomics practice and expertise, and all other relevant inputs to the design of work systems becomes increasingly critical.

Train4HCWork will develop, implement and set the basis for a European dissemination of a new online course focused on the design of human-centred workplaces that will contribute to address such challenges.

Human centered workplaces are a key essential part of the factories of the future due to important advantages:

- Increase flexibility
- Increase agility
- Increase competitiveness
- Reduce occupational and work-related diseases
- Reduce absenteeism
- Reduce sick level caused by injuries

3. PILOT COURSE CONTENTS

MODULE 1: INTRODUCTION AND IMPORTANCE OF ERGONOMICS

Session 1: Introduction to ergonomics & human factors

Topics

In this introductory session, the participant is going to know the concept and objectives of ergonomics. Furthermore, this session addresses the necessity to take into account the ergonomic approach when designing products and jobs.

Objectives

- ✓ *To understand what ergonomics is.*
- ✓ *To know which are the sciences that inspire it.*
- ✓ *To learn the main areas in which ergonomics acts.*

Session 2: Importance of ergonomics in work design process

Topics

This session addresses the importance of the ergonomic approach in the workplace and indicates the consequences of not applying it (musculoskeletal disorders & diseases, accidents, sick leave, absenteeism, errors and production losses, quality failures, etc.)

Objectives

- ✓ *To understand the necessity to take into account ergonomic approach in design.*
- ✓ *To know the statistics and figures of injuries (diseases & disorders), accidents and losses of working days that are associated to poor ergonomics.*

Session 3: To finish and self-evaluation test

MODULE 2: ANTHROPOMETRY

Session 1: definitions and concepts

Topics

In this starting session, the participant is going to know the definition and objective of anthropometry applied to the design of workplaces, what are the main body dimensions related to design of workstations and elements of these.

Objectives

- ✓ *To become familiar with terms and concepts used in anthropometry.*
- ✓ *To learn the main body dimensions related to design of workplaces.*
- ✓ *To recognize the consequences of no consideration of anthropometry in the design.*
- ✓ *To know the international standards related to this topic.*

Session 2: influence on the design of workplaces

Topics

In this session, the participant is going to know the ergonomic criteria to be considered in the design of the workplaces about body dimensions. This session addresses the main strategies to follow in the design of elements of the workplace and the types of relationships that can be established between the dimensions of the workers and the main dimensions of the elements of the workstation. The participant will also learn what the standards say in this regard.

Objectives

- ✓ *To learn the ergonomic criteria and general recommendations about body dimensions based on heights, reaches, spaces and clearances.*
- ✓ *To know the strategies to follow in the anthropometric design.*
- ✓ *To understand the relationships that can be established between the dimensions of the users and these elements.*
- ✓ *To know the anthropometric aspects to be considered about older workers in design.*

Session 3: analysis and measurement methods/tools.

Topics

In this session, the participant is going to know how anthropometric population or individual studies are done, what are the main tools for register anthropometric data, and the standards related. Some anthropometric tools and studies will be presented.

Objectives

- ✓ *To know how anthropometric data are obtained.*

- ✓ *To expose different existing technologies and tools, from manual instruments to 4D scanners.*
- ✓ *To know anthropometric data sources available.*

Session 4: simulation tools for the design

Topics

This session addresses some existing tools related to the anthropometric design of workstations and elements (e.g. RAMSIS, Ergo/IBV).

Objectives

- ✓ *To know some tools that allow integrating the anthropometry in the design, simulating during the first phases of the design how will be the relations between the dimensions of the user and their future position.*

Session 5: practical example

Topics

In this session, the participant is going to know and understand a practical example where design solutions for ergonomic improvement are proposed. The criteria to be used and how to apply them are also explained.

Objectives

- ✓ *To present a design problem.*
- ✓ *To analyse an example of ergonomic design.*
- ✓ *To know solutions proposed for the ergonomic improvement of the workplace.*

Session 6: To finish and self-evaluation test

MODULE 3: BIOMECHANICS AND WORK PHYSIOLOGY

Session 1: definitions and concepts of analysis of physical workload

Topics

In this session, the learner/ user is going to know the main concepts and ergonomic principles related to work system in production and physical workload (working posture, action forces, manual material handling). The learner will also study the international regulation documents, ISO and EC standards related to assessment of physical stress and physiological strain

Objectives

- ✓ *To learn the concept of work system and the elements, that must be considered related to physical work load during the design of production /industrial work systems.*

- ✓ *To learn the main concepts (e.g. stress-strain-concept) and factors that must be considered related to physical work load during the design of workplaces and working tools*
- ✓ *To know the international regulation documents, standards related to the topic.*

Session 2: influence on the design of workplaces (i). ergonomic criteria. general recommendations

Topics

In this session, the participant is going to know the ergonomic criteria to be considered in the design of the workplaces based on body postures, movements and efforts. The participant will also learn what the standards say in this regard.

Objectives

- ✓ *To learn the main work postures, their advantages and disadvantages.*
- ✓ *To study a method to determine the main work posture.*
- ✓ *To know the ergonomic criteria regarding the positions of the different body segments.*
- ✓ *To know ergonomic criteria regarding the movements at the workplace.*
- ✓ *To define the types of effort and general recommendations regarding these in different tasks and elements.*
- ✓ *To present some limit values.*
- ✓ *To define the effort aspects to be considered with older workers in workstation design.*

Session 3: influence on the design of workplaces (ii)

Topics

In this session, the learner/user is going to know and to understand the main biomechanical and physiological factors related to the design of workplaces with mainly physical workload (e.g. action forces, manual material handling, repetitive movements of upper extremities). Management and optimization of physical workload (overload and underload), focus on ergonomic measures and job/task design. The learner will also study the international regulation documents, ISO and EC standards related to analysis /assessment of physical workload

Objectives

- ✓ *To understand the analysis of workload deals with biomechanical factor action forces and ergonomic design measures.*
- ✓ *To understand the analysis of work load deals with manual material handling and ergonomic design measures*
- ✓ *To understand the analysis of work load deals with repetitive movements of upper extremities and ergonomic design measures*
- ✓ *To understand the management of physical work load on working places in production*
- ✓ *To define ergonomic recommendations (technical, organizational) related to physical workload and integration of productivity and human-centered manufacturing*

- ✓ *To define aspects to be considered with gender and older workers in workstation design.*

Session 4: analysis and measurement methods and tools (i)

Topics

This session addresses some existing methods and tools related to the ergonomic assessment of physical workload and redesign of workstations and elements (e.g. AAWS, EAWS).

Objectives

- ✓ *To know how aspects of physical workload (working postures, action forces, manual material handling, repetitive movements of upper extremities) can be assessed by using simple screening tools (e.g. AWSlight) or experts screening tools (e.g. EAWS)*
- ✓ *To know main principles how to apply the expert screening tool*
- ✓ *To know how to integrate the anthropometrical, biomechanical aspects to summarized score of physical workload.*
- ✓ *To know how the results of analysis/ assessment can be used to redesign the workplace, job, task.*
- ✓ *To know advantages and disadvantages some existing screening tools and measurement methods in the practice.*

Session 5: analysis and measurement methods and tools (ii). tools for ergonomic workloads assessment and redesign (e.g. ergo/ibv)

Topics

This session addresses some existing tools and examples related to the ergonomic workload assessment and redesign of workstations and elements (e.g. Ergo/IBV).

Objectives

- ✓ *To know how workload can be assessed and this analysis can be used to redesign the task.*
- ✓ *To present some existing tools.*

Session 6: practical example

Topics

In this session, the participant is going to know and understand a practical example where design solutions for ergonomic improvement are proposed. The criteria to be used and how to apply them are also explained.

Objectives

- ✓ *To present a design problem.*
- ✓ *To analyse an example of ergonomic assessment and design.*
- ✓ *To know solutions proposed for the ergonomic improvement of the workplace.*

Session 7: simulation methods and tools for the design

Topics

This session addresses some existing simulation methods and tools related to testing of design of workstations and elements in the planning phases related to anthropometric, biomechanical and physiological aspects (prototype making) (e.g. IMK-EMA-Tool).

Objectives

- ✓ *To know some simulating tools for human centered design process of workplaces and production lines that allow to perform the ergonomic analysis and design in the planning phase by developing of concepts for work place, work process*

Session 8: To finish and self-evaluation test

MODULE 4: MENTAL WORKLOAD

Session 1: definitions and concepts

Topics

In this session, the participant is going to know the main concepts and ergonomic principles related to cognitive and mental workload. The participant will also learn what the standards say in this regard.

Objectives

- ✓ *To learn some of the main concepts and factors that must be considered related to cognitive load during the design of workplaces.*
- ✓ *To know the international standards related to this topic.*

Session 2: influence on the design of workplaces

Topics

In this session, the participant is going to know and understand the main factors related with the design of workplaces (e.g. management of cognitive and attentional resources, cognitive overload and underload, focus on primary and secondary tasks, etc.). The participant will also learn what the standards say in this regard.

Objectives

- ✓ *To understand the management of cognitive and attentional resources.*
- ✓ *To define the cognitive aspects to be considered with older workers in workstation design.*

Session 3: measurement methods and simulation tools

This session addresses some general methodologies for the assessment of mental workload at workplaces. The participant will also learn some specific techniques for the

measurement and registration of mental and emotional load through physiological signals, as well as behaviour.

Objectives

- ✓ *To know some general methodologies for the assessment of mental workload at work.*
- ✓ *To present some techniques to register and monitoring physiological signals related to mental, emotional and behavioural responses.*

Session 4: practical example

Topics

In this session, the participant is going to know a practical example of application of these register techniques to the design of environments.

Objectives

- ✓ *To present a design problem.*
- ✓ *To analyse the example.*
- ✓ *To know solutions proposed for the ergonomic improvement.*

Session 5: To finish and self-evaluation test

MODULE 5: ENVIRONMENTAL CONDITIONS

Session 1: visual comfort (i)

Topics

In this session, the participant is going to know and understand visual comfort concepts, and their influence on the design of workplaces.

Objectives

- ✓ *To introduce the concept of visual ergonomics and the factors that should be considered.*
- ✓ *To indicate the consequences and problems derived from inadequate lighting.*
- ✓ *To raise the importance of colour within visual ergonomics and the psychological effects that colour can have.*
- ✓ *To define the visual aspects to be considered with older workers in workstation design.*

Session 2: visual comfort (ii)

Topics

This session addresses a measurement method and simulation tool.

Objectives

- ✓ *To explain how lighting is measured in a workplace.*
- ✓ *To present a simulation tool for the design of workplaces.*

Session 3: acoustic comfort (i)

Topics

In this session, the participant is going to know and understand acoustic comfort concepts, and their influence on the design of workplaces.

Objectives

- ✓ *To introduce the main concepts of acoustic comfort.*
- ✓ *To indicate the consequences and problems derived from inadequate acoustic work-environment and the negative effects of noise at levels that do not cause loss of hearing (offices).*
- ✓ *To introduce the importance of music in the work environment.*
- ✓ *To define the acoustic conditions to be considered with older workers in workstation design.*

Session 4: acoustic comfort (ii)

Topics

This session addresses measurement methods.

Objectives

- ✓ *To explain how noise is measured in a workplace.*
- ✓ *To develop acoustic comfort assessment methods.*

Session 5: thermal comfort (i)

Topics

In this session, the participant is going to know and understand thermal comfort concepts, and their influence on the design of workplaces and products.

Objectives

- ✓ *To introduce the main concepts of thermal comfort.*
- ✓ *To know the factors that influence in thermal comfort.*
- ✓ *To indicate the consequences and problems derived from inadequate thermal work-environment.*
- ✓ *To introduce the main recommendations to achieve thermal comfort, as well as preventive control measures to establish exposures to cold or hot environments.*

Session 6: thermal comfort (ii)

Topics

This session addresses a measurement method and simulation tool.

Objectives

- ✓ *To explain the main methods and techniques to assess thermal comfort.*
- ✓ *To present a simulation tool for the design (e.g. environmental chamber).*

Session 7: practical example

Topics

In this session, the participant is going to know a practical example of application of these methods and register techniques to the design.

Objectives

- ✓ *To present a design problem.*
- ✓ *To analyse the example.*
- ✓ *To know solutions proposed for the ergonomic improvement.*

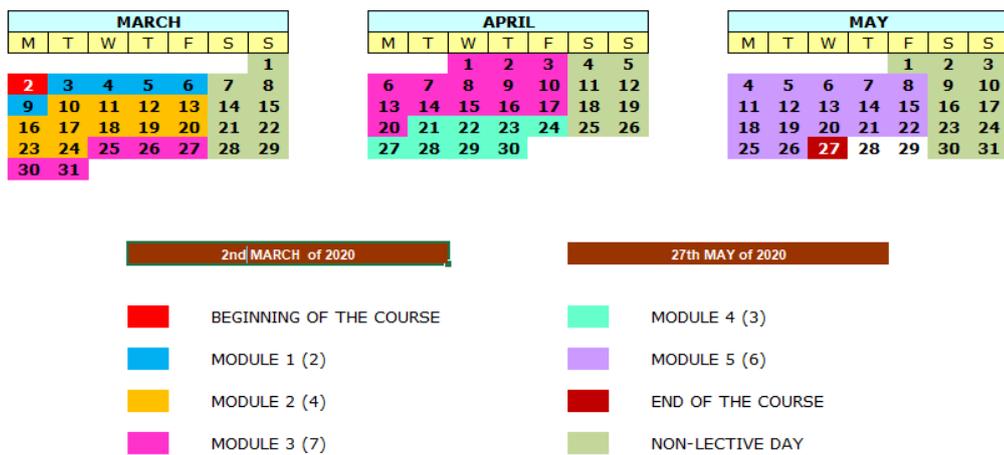
Session 8: To finish and self-evaluation test

4. TIME PLANNING

The course will take place from **March 2, 2020 to May 27, 2020** but the contents will remain available during approximately one month after the end of the course in order to let the students see their record and find any information they need.

The course planning involves studying **1 hour** per day as marked on the calendar. Obviously, each student can set his or her own pace of study and decide when to connect to the platform, when to do an activity, etc. Occasionally, there may be activities (such as taking part in a forum) that take place only on specific days

ONLINE TRAINING COURSE ON DESIGN, OF HUMAN-CENTRED WORKPLACES



This time allocation does not mean time connected. It is possible to work with the contents without being connected, although it is necessary to be connected to do some tasks. The academic calendar planned for the course that will help students organize their study is shown below:

The calendar is interpreted as follows:

Each color belongs to a different date/matter.

- The days on which the course starts and ends are colored brown (**March 2, 2020 to May 27, 2020**).
- Vacation days are colored green. Study is not planned during vacation days, so they are perfect days for the student who has fallen behind to catch up with the course.
- The other colors show how many days are allocated to the study of each section (one of the four Modules).
- This calendar is also used as a reference to monitor the student's progress through the course.

5. METHODOLOGY

HOW DO I HAVE TO STUDY? HOW IS THE COURSE STRUCTURED?

This section includes the answer to this type of questions about the learning method designed for this e-learning training course.

As soon as you start, you will meet the classroom facilitator, who will welcome you to the course and, together with your tutor/expert (specialized in the area addressed by the course) will guide your learning throughout the process.

Studying on paper is different from studying in front of a computer screen, but the communication tools of the platform will make the study easier, more enjoyable and more dynamic:

- **E-mail.** It makes it possible to communicate within the platform and is very appropriate to ask question in a personalized way.
- **Forum.** As messages are public, issues of general interest can be raised.
- **Instant messaging.** It makes it possible to communicate and chat in real time with those mates who are also connected.

WHAT IS THE FOLLOW UP LIKE?

The methodology of the courses proposed by the IBV involves **monitoring the student learning progress**.

The different **tools** that will help students and teachers monitor the study are as follows:

- **News.** Panel through which facilitators remind students about important dates in the course (e.g.: the date of an exam, practice, etc.)
- **Calendar.** The course calendar shows the student how many days are allotted to the study of each module.
- **Grades.** The virtual platform allows students to see their assessments, the activities done, etc.
- **Personalized monitoring for each student.** The facilitators will carry out several follow-ups of the students' activity during the course to encourage them and consider their individual pace of study.
- **Course general forum.** The general forum is available to the students, where facilitators and tutors take part, together with the students, by managing any inquiries and concerns that may arise.

RECOMMENDATIONS TO START STUDYING

Bear in mind that studying online changes the traditional role of students in the learning process, who become protagonists by using ICTs. For this reason, **our**

methodology offers the student a series of recommendations to make the most of the course.

- **Read the “TO BEGIN” section** to become familiar with the virtual learning environment. This section contains this teaching guide of the course and some frequently asked questions that can help you solve your doubts.
- **Observe the tools** available on the platform, how the different spaces are used and how to use them. (It is very important, for instance, to see the calendar and the dates marked on it).
- **Know your profile.** Your profile identifies you, we encourage you to put a photo so that we can all create a friendlier space.
- **Choose the most convenient time for your study.** Since there is no rigorous schedule, the student will have to organize a flexible one.
- **Visit the library** to view or download documents related to the course contents.
- If you have any questions, **do not feel alone, you can contact the tutors or your classmates** through the course general forum, email, instant messaging, etc.
- The course has a recommended **study calendar** which you can follow or set your own learning pace; however, remember that if you fall behind, you will not be able to take part in any of the activities scheduled (for example, a forum designed to participate with your colleagues on specific days).
- **Perform a regular monitoring of the virtual classroom.** It is necessary to respect deadlines and the course pace so as not to reduce interactivity. Each person has different learning paces, but it is also essential to enter and see the recommended pace of the course, since there are forums that open and close within a specific period of time.
- **Learn how to see your record.** There is a section in the course where you can see your grades at any moment.
- **Form a learning community.** This means being open to a permanent exchange of opinions, open to work as a team and considering interaction as part of this type of training, and not limited to solving specific doubts.
- **Perform autonomous research** by looking for more information on the subjects and sharing it with your mates through the forum.

The main rules for **studying online** do not differ much from the traditional ones. It is advisable to have self-motivation, enthusiasm for knowledge, organization of your study time, search for information (autonomous research is ideal to share with mates) and, above all, desire to learn.

6. RESOURCES

This section includes the resources (symbols, types of activities, etc.) of the methodology that the students will find when reading the study materials.

6.1 RESOURCES IN THE TEACHING UNITS

- **Examples.** The student will find examples that stand out in this format:

Example

This is an example of a resource that you will find when reading the teaching units of the course.

- **Explaining/ expanding on a concept:**

Concept

Through this resource we highlight some explanations, definitions of concepts that appear when reading the materials.

- **Expanding on the content.** The tables with the following format expand on the content:

Expanding on the content. Collagen fibers

“Since the creep velocity is primarily governed by the flow velocity of the interstitial fluid, this technique can be used to determine the...”

- **Highlighted tables.** In addition, some ideas stand out in a table whose format includes pencils drawn in the title:



The therapeutic objectives of any lower limb prosthesis will be:

- **Functional**
- **Esthetic**
- **Psychological**

- **Bibliography.** You will find the general bibliography section of the course in a document available in the virtual classroom library. However, some teaching units include the bibliography that refers to that text in particular.

6.2 RESOURCES IN THE ACTIVITIES OF THE COURSE

Throughout the course, you can find various types of activities, the most used are those detailed below:

- **Activity questionnaires.** Each session offers two or three exercise with automatic checking to test the knowledge acquired by the student and to reinforce it (they are exercise of true/false, completing a sentence, multiple choice, etc.).

7. TEACHING STAFF

How will I communicate?

Communication with the teaching team and the rest of the classmates is carried out through the forum and the Virtual Campus instant messaging.

You will receive personalized support from the course facilitator, who will guide your learning and follow your progress according to the recommended study schedule. There are also teachers who are experts in the area and will solve your questions.

If you have any doubts about the theoretical content or the activities, please contact by writing in the forum or, if it is a personal or particular topic, to the following address: campus.ibv@ibv.org

QUESTIONS THROUGH THE FORUM. Post your doubts in the general forum of the course.

This forum can be found on the main page of the course, in the header, outside the modules. The tutors will answer you through it.

QUESTIONS VIA EMAIL/TELEPHONE. For particular inquiries that should be individually treated, the student has an email address and a telephone number to contact through:

- **Contact person:** Training staff
- **Email address:** campus.ibv@ibv.org

8. ASSESSMENT

The assessment is conceived as a continuous process that allows us to collect and analyze information to give a value judgment and which must be applied to all the elements that make up the learning process.

The certificate of achievement will be issued when the student has passed both the theoretical and practical part of the contents of the course.

The assessment will consider:

- Completion of the course activities (40%)
- Completion of the final exam (60%)

9. CERTIFICATE

After notifying the results of the final assessment to all the students, the Certificates of Achievement of the course will be issued within approximately one month from the date of the request.

The organization responsible for the direction and coordination of the course (Instituto de Biomecánica de Valencia - IBV) will send the student certificates by post. For this reason, it is very important to have the correct address of the student, who should communicate any modifications of such address.

For any questions about the certificates:

- **Customer Support:** 96 111 11 80
- **E-mail:** campus.ibv@ibv.org

Certificates of Achievement issued by the Instituto de Biomecánica of Valencia (IBV)



Consortium:



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