

<b>ID</b>	2043
<b>Curricular Unit</b>	Design of Physical Systems
<b>Regent</b>	Francisco dos Santos Rebelo
<b>Learning Outcomes</b>	<ul style="list-style-type: none"> <li>- Understand the relationship between Design and Ergonomic Design.</li> <li>- Mastering the contributions of Anthropometry and Biomechanics in Ergonomic Design (clearance, reach, posture and strength).</li> <li>- Identify anthropometric measurements bi or three-dimensional, depending on the design requirements of a system.</li> <li>- Mastering how anthropometric and functional characteristics of a population impose constraints on the design process.</li> <li>- Know the Digital Human Models (DHM) developed under the ergonomic design.</li> <li>- Mastering the use of a two-dimensional DHM in the optimization of a system.</li> <li>- Using a three-dimensional DHM to evaluate the effect of forces on the human body, in terms of design proposals.</li> <li>- Justify design solutions of physical systems (workspaces and layouts) using criteria of safety and comfort for potential users and system efficiency.</li> </ul>
<b>Syllabus</b>	<p>Intervention under Design Physical Systems:</p> <ul style="list-style-type: none"> <li>- The practice of Ergonomic Design within multidisciplinary teams;</li> <li>- Methodological approaches in the design;</li> <li>- Selection of anthropometric data according to the requirements of the design problem.</li> </ul> <p>The Digital Human Models (DHM) in the Design of Workspaces:</p> <ul style="list-style-type: none"> <li>- The evolution, classification, advantages and application areas of DHM models;</li> <li>- Study of WorkMan HARSIM and models developed in the laboratories of FMH Ergonomics Laboratory/ Ulisboa;</li> <li>- Optimization of jobs with HARSIM model.</li> </ul> <p>Designing workspaces and layouts using two-dimensional DHM:</p> <ul style="list-style-type: none"> <li>- Domain in the development and editing of primitive two-dimensional graphics using a program for computer aided design;</li> <li>- Parameterization of two-dimensional DHM;</li> <li>- Optimization of layouts and workplaces, in terms of anthropometric variables (clearance, reach, posture and strength) and the requirements of the work situation, using DHM.</li> </ul>

## Evaluation

Oral presentations supported by PowerPoint, about the different topics of the program. The mastering related to computer-aided design, two-dimensional Digital Human Models and HARSIM, is developed with real examples of work done in the Laboratory of Ergonomics of FMH/Ulisboa. At the end of this course, students must defend a project (development of a physical system), associated with the contents taught in the course. It is a discipline with a strong practical component, aspect that is reflected in the evaluation model. Continuous assessment: 50% practical component (worksheets) and final work + 50% theoretical component (final exam) with minimum of 9.5 in each component.

Final evaluation: exam (50%) and defense of a practical work (50%).

## Bibliography

Human Factors Design Handbook, by E. Woodson, Peggy Tillman, and Barry Tillman, McGraw-Hill Professional; 2 edition, 1992.  
The Measure of Man and Woman: Human Factors in Design, by William S. Green, Patrick W. Jordan, Wiley; Har/Cdr edition, 2001.  
Work Design: Industrial Ergonomics, by Stephan A. Konz, Steven Johnson. Holcomb Hathaway Publishing; Fifth edition, 1999.  
The Ergonomics of Workplaces and Machines. A Design Manual, by Clark T.S. Taylor & Francis, London and Philadelphia, 1984.  
Bodyspace Anthropometry, Ergonomics and Design, by Pheasant S. Taylor & Francis, 1989.  
Human Factors in Engineering and Design, by McCormick E McGraw Hill, Inc., 1976.  
Workspace, Equipment and Tool Design, by Mital A. and W. Karwowski Elsevier, 1991.  
Computer-Aided Ergonomics. A Research's Guide, by Karwowski; A. Genaidy and S.S. Asfour. Taylor & Francis, 1990.  
Human Factors in Product Design: Current Practice and Future Trends, by W. Green, Patrick W. Jordan. CRC, 1999.