ID	506
Curricular Unit	Design of Physical Systems
Regent	Francisco dos Santos Rebelo
Learning Outcomes	- Understand the relationship between Design and Ergonomic Design. - Mastering the contributions of Anthropometry and Biomechanics in Ergonomic Design (clearance, reach, posture and strength). - Identify anthropometric measurements bi or three-dimensional, depending on the design requirements of a system. - Mastering how anthropometric and functional characteristics of a population impose constraints on the design process. - Know the Digital Human Models (DHM) developed under the ergonomic design. - Mastering the use of a two-dimensional DHM in the optimization of a system. - Using a three-dimensional DHM to evaluate the effect of forces on the human body, in terms of design proposals. - Justify design solutions of physical systems (workspaces and layouts) using criteria of safety and comfort for potential users and system efficiency.
Syllabus	Intervention under Design Physical Systems: - The practice of Ergonomic Design within multidisciplinary teams; - Methodological approaches in the design; - Selection of anthropometric data according to the requirements of the design problem. The Digital Human Models (DHM) in the Design of Workspaces: - The evolution, classification, advantages and application areas of DHM models; - Study of WorkMan HARSIM and models developed in the laboratories of FMH Ergonomics Laboratory/ Ulisboa; - Optimization of jobs with HARSIM model. Designing workspaces and layouts using two-dimensional DHM: - Domain in the development and editing of primitive two-dimensional graphics using a program for computer aided design; - Parameterization of two-dimensional DHM; - Optimization of layouts and workplaces, in terms of anthropometric variables (clearance, reach, posture and strength) and the requirements of the work situation, using DHM.

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.