

**Unidade Curricular:** Product and Process Design

**Área Científica:** CE

**Duração:** Semestral

**Horas de trabalho:** 162

**Horas de contacto:** 45

**ECTS:** 6

**Docente Responsável:** Isabel Maria da Silva João

**Learning outcomes of the curricular unit**

The curricular unit of Product and Process design has as main objective to develop a set of concepts related to the development of new products and their impact on production, marketing, use and end of life. This curricular unit presents the various stages of product design and make an approach to the various tools used in product design. The course aims to provide students with the understanding of the various stages of product design, and also the skills to know how and when to use the main tools used in the design of new products, and also provide students with the necessary skills to enhance the communication of ideas either verbally or written.

**Syllabus**

Introduction to product design. The various phases of product development.

Planning product. Identify opportunities, allocation of resources and setting goals.

Identification of needs: data collection; Interpretation of data in terms of needs; Organization needs; Relative importance.

Product Specifications: definition and conversion of customer requirements into specifications; Revision of specifications;

"Benchmarks"; Quality function deployment. Target specifications.

Product concepts generation: the activity of concept generation; Clarification of the problem; external demand and internal demand; Systematization.

Selection of concepts: Structuring the problem; screening and classification.

Concept Tests. Analytical and physical prototypes.

Intellectual property and technology transfer. Patents.

Pre-production. Process Development, Scale-up.

Inclusion of environmental issues in product development. Design for environment (DFE).

Lifecycle Analysis.

**Demonstration of the syllabus coherence with the curricular unit's learning objectives.**

The product and process design is a set of activities ranging from the perception of the market opportunity, idea generation, selection of concepts and test prototypes until the final specifications ending in the production, sale, use and end of life. A good product design is crucial in this age of mass production and aims to develop environmentally friendly products, socially just and economically viable. In this sense the various points of the program develop the various stages of product design by providing a set of tools used in the design of new products providing the students with the right skills for their use.

**Teaching methodologies (including evaluation)**

Teaching methodologies:

Expositive methodologies to explore concepts and theory. Active methodologies involving the active participation of the students in the resolution of the problems or case studies in order to explore some issues related to know how to do and how to apply the theoretical knowledge acquired.

Continuous assessment comprises two partial tests (T1 and T2) where the knowledge acquired is tested.

To obtain approval by continuous assessment  $(T1 + T2) / 2 \geq 10$  as long as T1 and T2 have a minimum score of 8 values.

Final exam evaluation:

Final Exam (FE):  $FE \geq 10$  in a scale 0-20 in order to obtain approval

**Demonstration of the coherence between the teaching methodologies and the learning outcomes**

After the frequency of product and process design it is expected that the students know and understand the various stages of product design, learn how to use the various tools taught in a real context and also that they have the critical and analytical skills to develop sustainable products and learn to apply and integrate the knowledge gained from the undertaking work. The problem-based learning better prepares students for solving real problems, facilitate the application of various tools by students and will provide retention of the acquired knowledge, and a way of stimulating learning new subjects.

**Mandatory consultation/existence bibliography:**

1. E.L. Cussler, G.D. Moggridge, Chemical Product Design, Cambridge University Press, 2001.
2. K.T. Ulrich, S.D. Eppinger, Product Design and Development, 3rd Ed., McGraw-Hill, 2003.
3. W.D. Seider, J.D. Seader, D.R. Lewin, S. Widagdo, Product & Process Design Principles: Synthesis, Analysis, and Evaluation, 3rd Ed., Wiley, 2010.
4. L.V. Shavinina, The international handbook on innovation, Pergamon, 2003.
5. P.G. Smith, D.G. Reinertsen, Developing products in half the time: new rules, new tools, 2nd Ed., John Wiley & Sons, 1998