PROJETO GENERATIVO

Code: 20904

Main Scientific Area: Health, Environment and Industrial Technologies

Lecturer: Filipe José Palhares Chaves

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 30h Total Workload: 130h

ECTS: 6,0

Objectives

The general objectives of the course are: I – Know the materials and their mechanical behavior, listing the parameters of interest for computer simulation; II- Know the available and suitable manufacturing processes for each material, geometry and function; III – Know how to model geometries in computer-aided design software; IV- Prepare the parameterization of simulations of computational tests, and know how to interpret the results; IV – Prepare the communication of information collected in written reports and public presentations.

Learning Outcomes

The student should be able to model parts with different materials, simulating their mechanical behavior, and optimizing the geometry for use and manufacture through suitable software, promoting topological analysis and generative design. You should be able to use knowledge of materials science, technical design and three-dimensional modeling, along with manufacturing processes and cost analysis, to program the best solution that meets the requirements

Course Contents

In this UC advanced knowledge of generative design is taught:

Presentation of the Curricular Unit with the program, objectives and evaluation.

Material science and manufacturing technologies.

Generative Design and Topological Optimization - concepts

Distribution of the first work (Characterization of the manufacturing material, through mechanical tests) of group by the different groups

3D parametric modeling

Finite Element Models (FEM) - simulation of physical behavior

Presentation of the first group work.

Design optimization in 3D modeling (3D modeling)

Distribution of the second group work (generative project) by the different groups

Design optimization in 3D modeling (geometry and materials)

Design optimization in 3D modeling (manufacturing processes)

Design optimization in 3D modeling (artificial intelligence algorithms)Presentation of the second works (project reports and test parts)

Recommended Bibliography

- Krish, S. (2011). A practical generative design method. Computer-Aided Design, 43(1), 88-100.

- McCormack, J., Dorin, A., Innocent, T. (2004). Generative design: a paradigm for design research. Proceedings of

Futureground, Design Research Society, Melbourne.

- Singh, V., Gu, N. (2012). Towards an integrated generative design framework. Design Studies, 33(2), 185-207.

Learning and Teaching Methods

Theoretical-practical classes allow the exposition of the subject and the organization of the work with different moments of testing materials, manufacturing by additive and subtractive process and three-dimensional computer modeling.

The optimization of the geometry through the generative process and the manufacture of the part allow the concepts to be sedimented, with the knowledge put to the test through the test of the final project with a score established to evaluate the final result.

Assessment Methods

20% - Report I (characterization and mechanical testing of the materials used for the project part)

80% Report II (Modeling and optimization by generative design (40%) for manufacturing (20%) and mechanical testing of the proposed part (40%))