Universidad Zaragoza

Academic Year/course: 2024/25

62952 - 3D modelling with smart geometry

Syllabus Information

Academic year: 2024/25
Subject: 62952 - 3D modelling with smart geometry
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 562 - Master's in Product Development Engineering
ECTS: 4.5
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

This subject covers two objectives: first, to experiment and integrate various geometric computer modelling methods not contemplated in CAD technology to create complex, organic or iterated shapes and, second, to learn how to manipulate geometry made up of polygon meshes to achieve an optimal topology that facilitates the connection of the design/modelling process with other production cycle disciplines such as additive manufacturing, graphic simulation or structural calculation. It is a practical subject in which real projects are reviewed and in which the student uses commercial software of proven technical quality, which improves their professional and curricular training.

2. Learning results

- To be able to model natural, highly heterogeneous organic forms that link, for example, mechanical design with biomedical disciplines.
- To learn how to improve products, for example, those using reverse engineering through more efficient topologies.
- To be able to develop new modelling strategies, to investigate iterated forms or to design essentially deformable objects.
- To learn how to solve modelling problems without using CAD and working in a team.

3. Syllabus

- BLOCK 01: Modelling with polygons. Mesh reconstruction techniques and adaptive topologies. Deformers and geometry modifiers. Mesh redesign using *voxels*
- BLOCK 02: Temporal modelling systems. *Morphing* tools. Particles and fluid modelling.
- BLOCK 03: Modelling by means of graph nodes and techniques for parametric or iterative model creation.
- BLOCK 04: Organic modelling using "*zspheres*". Digital sculpture and modelling techniques with high polygonal density meshes. Engraving and detailing by means of filters and images. Combination of models and creation of shell-like morphologies.
- BLOCK 05: Modelling of natural elements composed of fibres. Creation of geometry by simulation of fabric behaviour.
- BLOCK 06: Review of complementary techniques, treatment and repair of digitized meshes.

4. Academic activities

- Participative master class: 5 hours. The contents of the subject will be presented, with a practical review of the existing advanced modelling tools and their application in product design cases.
- Laboratory practices: 25 hours. Two 3D modelling tools, which cover the whole subject and which are synergistically integrated, will be used.
- Supervised work (homework): 40 hours. The assignments cover a set of computer modelling activities oriented to cases chosen by the students within a proposal or topic. The total time includes the preparation of the necessary reports for the accreditation of authorship and description of the method chosen to solve the task. These tasks can be solved individually or in teams.
- Assessment tests: 5 hours.

5. Assessment system

- OPTION A: Assessment by project: it will be carried out by means of the presentation of the tasks with their corresponding report made by the student individually or in group. They will be presented on the date and at the time indicated. These will develop the contents covered in the subject. It will be graded from 0 to 10. In order to pass the

subject, the student must obtain a final grade not below 5.

- OPTION B: Following the regulations of the University of Zaragoza in this regard, in the subjects that have assessment systems with project, a global evaluation test will also be scheduled for those students who decide to opt for this second system.

6. Sustainable Development Goals

8 - Decent Work and Economic Growth
9 - Industry, Innovation and Infrastructure
12 - Responsible Production and Consumption