

25895 - Advanced Technology for Prototyping and Reverse Engineering

Syllabus Information

Academic year: 2023/24

Subject: 25895 - Advanced Technology for Prototyping and Reverse Engineering

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 558 - Bachelor's Degree in Industrial Design and Product Development Engineering

ECTS: 6.0

Year: 4

Semester: Second semester

Subject type: Optional

Module:

1. General information

This subject aims to provide the student with an overview of the main techniques and technologies in the field of additive manufacturing and reverse engineering, as well as their application in the production sector from the point of view of redesign, inspection and quality control, obtaining geometric information and manufacturing with CAD/CAM systems. The subject aims to provide students with the ability to approach and successfully conclude procedures for obtaining prototypes or final parts through additive manufacturing and reverse engineering procedures, evaluating the result obtained and the achievement of the defined objectives and technical and economic requirements.

2. Learning results

Know and apply finite element calculation and optimization techniques for the evaluation of product design proposals.

Know the additive manufacturing technologies and be able to select the most suitable one following functional and economic criteria.

Know the workflow in additive manufacturing systems for prototyping and be able to complete it. Be able to integrate additive manufacturing and its benefits as a tool in the design cycle.

Know the reverse engineering workflow as a tool applied to design and be able to select the most appropriate digitizing system for each application.

Acquire skills in CAD reconstruction or quality control from point clouds coming from digitization.

Acquire skills in handling professional additive manufacturing systems.

3. Syllabus

The **theoretical-practical syllabus** includes the following topics

- 1.- Introduction to rapid prototyping and additive manufacturing
- 2.- Prototyping phases, workflow and integration into product development cycle
- 3.- Additive manufacturing technologies and system selection. Software and file formats
- 4.- Introduction to reverse engineering
- 5.- Digitization, measurement and data acquisition systems. CAD reconstruction. Software.
- 6.- Applications of additive manufacturing in industrial, medical, artistic and heritage conservation sectors

Practices and company visits

1. Photopolymerizable resin 3D printer. File management and printing software. Principle of operation, operation and maintenance
2. Photopolymerizable resin 3D printer. Generic CAD for part design. Obtaining and analyzing files. Printing, cleaning and finishing of prototypes.
3. Reverse engineering. Digitizing of parts with laser sensor by triangulation and articulated measuring arm by coordinates. Coordinate measuring machines and laser tracker.
4. Reverse engineering. CAD reconstruction from point clouds.
5. Reverse engineering. Inspection against point cloud CAD.
6. Integration of coursework and printing of group prototypes.
7. Company visit / CAD reconstruction session / coursework.

4. Academic activities

The proposed methodology seeks to encourage continuous student work and focuses on both theoretical and practical aspects

of additive manufacturing, reverse engineering and prototyping, as well as their main applications and application sectors.

In the sessions with the full group, the more theoretical aspects are dealt with in the form of participative lectures and are completed with the study of technical cases. The practical work with the computer applications is developed in smaller groups and will focus on case-based work methodologies that facilitate the realization of the preliminary project of the subject.

If possible, the knowledge of equipment and technologies available for the work and practical sessions are complemented with a company visit with other rapid prototyping technologies integrated in new product development as a daily activity.

5. Assessment system

Assessment of the practical application of knowledge through an integrated project of design alternatives for components of industrial assemblies or consumer goods by integrating both rapid prototyping techniques and reverse engineering. (60%)

Assessment of the theoretical and practical knowledge acquired through the presentation of contents and technical cases (20%)
This evaluation will be carried out gradually during the term. In case of not attending the evaluations, an overall test will be given.

Assessment of skills acquired from the practical sessions (20%)

It will be carried out through direct observation of the results achieved, which in some cases must be completed with personal work and formalized in a report.

Note: Following the regulations of the University of Zaragoza in this regard, in the subjects that have continuous or gradual evaluation assessment, a global assessment test will also be scheduled for those students who decide to opt for this second system.