Universidad Zaragoza

Academic Year/course: 2024/25

25894 - Technical Analysis for Design Proposals

Syllabus Information

Academic year: 2024/25
Subject: 25894 - Technical Analysis for Design Proposals
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: First semester
Subject type: Optional
Module:

1. General information

The design of products in any material is an activity that concerns almost all industrial sectors.

It is necessary to know how to integrate from the beginning materials, part design, manufacturability and guarantee of feasibility and functionality in terms of kinematics, strength and stiffness according to tests imposed by regulations or EDP's.

The objective of this subject is to work on the concepts and methodologies that allow, by means of modeling tools, a numerical calculation to reach the successful design of a product or mechanism, thinking not only in its aesthetics and functionality, but also to do it in an efficient and sustainable way.

2. Learning results

In order to pass this subject, the students shall demonstrate they has acquired the following results:

1. Know the mechanical design criteria of parts and assemblies with different materials, technically assessing the restrictions imposed by load books, tolerances, lot sizes, etc.

2. Know and apply finite element computation techniques for the evaluation and

optimization of product design proposals.

In a more specific way:

- Can perform a linear static calculation by applying the method of the

Finite Elements (hereinafter FEM), as well as to analyze and correctly interpret the numerical results obtained in the simulation.

- Know how to perform geometrical optimizations of models through the application of FEM, and be able to select the appropriate material model and optimal properties, mainly based on stiffness and strength criteria.
- Know how to perform 2D motion and 3D kinematic and dynamic calculations by means of integrated solver in CAD programs, which use the assembly position relations and the contacts between solids by means of.

3. Syllabus

- MODELING. 3D modeling (metal/plastic). Obtaining discretizable geometries for meshing, and modifiable according to test results. 15% of agenda.
- ASSEMBLED. Positions between parts, taking into account relative movement (kinematics), or static (FEM). 10% of agenda
- MOVEMENT. Kinematic and dynamic calculation of mechanisms. Load application, springs, motors/drives. Plotting/interpretation of results. 25% of agenda.
- SIMULATION. Methodology/calculation tools simulation -Elements Method Finite Element Analysis (FEM) for static analysis: Problem definition-Case preparation (material, fasteners, loads, meshing-Case execution-Tracing/Interpretation results. 40% of the agenda.
- OPTIMIZATION. Execution of case queues and optimization methodology according to cost/weight target. 10% of agenda

4. Academic activities

In the computer classroom (students with their own laptop)

- Theoretical classes of contents by the teacher (30 hours/15 sessions). Theoretical basis for simulation and guided examples while answering questions

- Group work problems (15 hours/6 sessions). Guided problem solving

(proposed in class and arising from the work of the subject).

- Practical classes (15 hours/5 sessions). Autonomous work before subject work.

Self-study (87 hours). There will be available a SolidWork educational license. The student will receive counseling and follow-up during tutoring hours. In Self-study it has been incluided 27 hours of work preparation by groups on a proposal common to all for assessment.

Assessment (3 hours).

5. Assessment system

CONTINUOUS ASSESSMENT:

- Practices (20% of the final grade).

Attendance is not compulsory, but it is valued with 50% and practical scripts with another 50%. Highest grade: 2 points. *Minimum 0.5 points to mediate.*

Problem solving (20% of the final grade):

Presentation on scheduled dates of the results of 4 problems derived from the course work. Having solved the problems coherently will add up to a maximum of 2 points. *Minimum 0.5 points to mediate.*

Final paper (60% of the final grade)

It will consist of a design proposal proposed by the teacher, common to all groups (2 or 3 people), admitting variations/creativity. Maximum achievable grade: 6 points. *Minimum of 3 points to mediate.* will be evaluated according to:

- Creativity, valuing geometries, aesthetics, modeling quality
- Quality of the technical report (presentation, order and clarity in the presentation of results)
- Quality of the oral presentation.
- Teacher's question time.
- Ability to debate with other students.

GLOBAL ASSESSMENT

Final paper (80% of the final grade)

Those who have not followed the subject will be able to defend an individual and free work of the level of the work proposed for the continuous assessment.

Practical exam (20% of the final grade)

Scripts of the practices carried out at home must be handed in on the day of the defense of the work

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure
11 - Sustainable Cities and Communities
12 - Responsible Production and Consumption