

66430 - Advanced design of home appliances

Syllabus Information

Academic year: 2023/24

Subject: 66430 - Advanced design of home appliances

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 536 - Master's in Mechanical Engineering

ECTS: 4.5

Year: 1

Semester: Second semester

Subject type: Optional

Module:

1. General information

Objectives of the subject

It is intended that the student understands the fundamental concepts of the design and operation of home appliances: ovens, countertops, washing machines, dishwashers and refrigerators, and applies basic and advanced design aspects in the appliance sector using experimental and computing technologies used in mechanical engineering.

Sustainable Development Goals of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>) : Goal 9: Objectives 9.2 and 9.5; Goal 12: Objectives 12.5 and 12.8; Goal 14: Objective 14.1; Goal 15: Objective 15.5

2. Learning results

1. To acquire analytical skills to determine the structural, thermal, and vibro-acoustic behaviour of household appliances.
2. To acquire practical skills for the application of experimental methodologies in the design and calculation of household appliances.
3. To analyse the structural behaviour of appliances and their components: introduction, methodologies and structural resolution tools.
4. Design methodology based on the combination of simulation techniques and test execution. General aspects, result analysis, model validation.
5. To acquire skills for the design and sizing of thermal systems in appliances.
6. To be able to apply the finite element method (FEM) to the virtual resolution of structural problems.
7. To acquire skills to characterize and rank the sources of noise and vibration in household appliances.
8. To acquire the skills for the control and reduction of noise and vibrations in household appliances.
9. To design, calculate and optimise household appliances components.
10. To know about the energy labelling of different appliances.
11. To propose and solve specific cases through the application of tools based on the FEM.

3. Syllabus

Thermal module

Energy labelling of appliances.

2. Simulation of thermal interactions.
3. Design process, thermal constraints.
4. Selection of materials.

Mechanical module

- 1.- Families and applications of plastic materials used in appliances.
- 2.- Mechanical behaviour of plastics of interest in engineering: creep, fatigue, temperature effect.
- 3.- Constraints of tools and machinery in the design of plastic components in appliances.
- 4.- Methodologies and tools for structural analysis.
- 5.- Structural design of components for refrigerators, washing machines, and induction cookers.
- 6.- Equipment and instrumentation used in noise and vibration measurement.
- 7.- Experimental and numerical modal essay
- 8.- Operational essay

4. Academic activities

- Master classes, problems and practical cases (33 hours)
- Laboratory practices (12 hours)
- Supervised work (9 non-face-to-face hours in a group). Several activities will be proposed and supervised by the teachers.
- Study and individual work (56 non-contact hours). The student is advised to study continuously throughout the semester.
- Assessment (2.5 hours)

5. Assessment system

The subject is preferably evaluated with a **continuous assessment** that consists of two blocks:

1. Thermal module : Development of works and practical cases on energy design and labelling of household appliances that will account for 35% of the final grade. Minimum grade to average: 1.5 points out of 10.
2. Mechanical module : Development of works on mechanical aspects seen in the subject that will account for 65% of the final grade. The assignments will be delivered in digital format. Later, on a date to be determined once the teaching sessions have ended, each group will present their work. All group members must participate in the presentation of the work. Afterwards, there will be a question and answer session about its content. Minimum grade to average: 3 points out of 10.

Alternatively, the student has the possibility of passing the subject by means of the **global evaluation** in the official calls for exams. In this case, the evaluation is carried out on the dates set by the centre through a written test on the theoretical and practical contents developed in the two thematic blocks (thermal and mechanical) which will represent 100% of the final grade.