Universidad Zaragoza

Academic Year/course: 2024/25

66226 - Energy Optimization

Syllabus Information

Academic year: 2024/25
Subject: 66226 - Energy Optimization
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 531 - Master's in Chemical Engineering
ECTS: 6.0
Year:
Semester: Second semester
Subject type: Optional
Module:

1. General information

This subject provides the fundamental principles for understanding, designing, selecting and operating energy equipment and facilities, as well as their optimal integration in chemical process plants and energy systems. It enables students to understand and use to advantage the specialized publications on control and design of chemical processes and energy systems. It deepens in the methodology of analysis, simulation, design and energetic, economic and environmental optimization of simple and advanced thermal installations, in the context of chemical process plants and energy systems.

2. Learning results

To know the constituent elements of energy production systems and the associated regulations.

To know and apply energy analysis, design and optimization techniques to chemical industry equipment and facilities.

To be able to size installations and select equipment for the production of energy services in industry and in the residential-commercial sector.

To be able to plan and implement an energy management system.

3. Syllabus

Physical fundamentals. Modelling and simulation of energy systems.

Energy integration. Optimal heat recovery. Heat pumps and refrigeration machines. Accumulation of heat and cold. Use of renewable energies.

Exergetic analysis. Diagnosis of equipment and plant operation.

Economic fundamentals. Economic evaluation principles and criteria. Introduction to thermoeconomics. Thermoeconomic and life cycle analysis of energy systems.

Mathematical programming. Optimality conditions and their economic significance.

Optimization techniques and programs. Optimal design of equipment and plants. Process synthesis. Polygeneration systems.

4. Academic activities

This is a 6 ETCS subject, which is equivalent to 150 hours of student work, which will be distributed into the following activities:

Theoretical master classes: 30 hours.

Problem and case solving classes 15 hours.

Simulation and laboratory practices: 15 hours.

Tutored autonomous works (20 non-face-to-face hours).

Tutored and personal study: (60 non-face-to-face hours).

Assessment 10 hours.

This subject is English Language Friendly (ELF). The study and class material is available in English and the teachers will attend office hours and prepare and evaluate students in English if they don't speak Spanish.

5. Assessment system

Continuous assessment

1. Problem solving and case studies of thermal installations in energy systems (components, functioning, constructive aspects, design and operation). By means of specialized computer tools, the student will learn to solve diagnostic problems about the operation and advanced design of the facilities.
2. Tutored work. The student, with the guidance of the teacher, will analyse the state of the art, solve complex problems and deliver a results report.
3. Public presentation of one of the tutored works and discussion with the teachers.

The grade for the subject will be calculated according to the following formula:

Grade= 1/3 **P**+ 1/3 **T** + 1/3 **E**

where: **P** is the grade for the practical sessions (assessment activity 1), **T** is the grade for the tutored work (assessment activity 2), and **E** is the grade for the presentation (assessment activity 3).

Global assessment.

Those students who do not wish to follow the continuous assessment will be evaluated through a final exam of the whole subject at the end of the term according to the exam calendar established by the centre.

In the second call, only the global assessment system will be followed.

6. Sustainable Development Goals

7 - Affordable and Clean Energy
9 - Industry, Innovation and Infrastructure
12 - Responsible Production and Consumption