

30119 - Applied thermodynamics and heat transfer basics

Syllabus Information

Academic year: 2023/24

Subject: 30119 - Applied thermodynamics and heat transfer basics

Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia

Degree: 425 - Bachelor's Degree in Industrial Organisational Engineering

ECTS: 6.0

Year: 2

Semester: Second semester

Subject type: Compulsory

Module:

1. General information

The purpose of the subject is to provide students with a firm foundation in the fundamental concepts of THERMODYNAMICS and to prepare them to use TECHNICAL THERMODYNAMICS in professional practice, as well as thermal solar energy concepts.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>), specifically, the learning activities planned in this subject will contribute to the achievement of target 4.4 of Goal 4 and target 13.3 of Goal 13.

This subject belongs to the compulsory training module of the company profile and does not have any normative prerequisite, although for its development it is necessary to bring into play knowledge from the Physics I subject of the first year on Thermodynamics.

2. Learning results

1. Describe thermophysical properties of industrial interest and use and select appropriate procedures and tools for their calculation.
2. Apply the laws of thermodynamics to the energy analysis of basic engineering equipment and processes.
3. Use the basic criteria for the analysis of thermodynamic cycles.
4. Apply basic heat transfer mechanisms to the analysis of thermal equipment.
5. Solve in a reasoned way basic problems of technical thermodynamics and heat transfer applied to engineering

3. Syllabus

1 THEORETICAL CONTENTS

Topic 1: Definitions and basic concepts.

Topic 2: First principle of thermodynamics for closed systems.

Topic 3: Thermodynamic properties of pure substances.

Topic 4: First law of thermodynamics for open systems.

Topic 5: The second principle of thermodynamics.

Topic 6: Steam cycles for work production.

Topic 7: Refrigeration and heat pump systems.

2 PRACTICAL CONTENTS

Practices to be carried out in sessions of 2 hours of duration.

Practice 1: Heat pump.

Practice 2: Thermal insulation.

Practice 3: Thermohygrography.

3 SEMINAR CONTENTS

Heat transfer. Introduction. Driving. Convection. Radiation. Overall heat transfer coefficients.

Calculation of cooling and heating thermal loads.

4. Academic activities

1. Generic face-to-face activities:

- Theoretical classes.
- Practical classes.
- Laboratory practices.
- Seminars.

2. Generic non face-to-face activities:

- Study and assimilation of the theory presented in the lectures.
- Understanding and assimilating problems and case studies solved in practical classes.
- Preparation of seminars, resolution of proposed problems, etc.
- Preparation of the laboratory practices, elaboration of the corresponding scripts and reports.
- Preparation of written tests and final exams.

Test 1. Topics 1, 2, 3, and 4, approximately week 7.

Test 2. Topics 5, 6 and 7, approximately week 15.

Laboratory practice: approximately in weeks 9, 10 and 11.

Seminars: approximately 10 weeks.

5. Assessment system

1. Split assessment system.

- Laboratory practices (20 %): Laboratory work and delivery of a paper. They are **mandatory**.
- Proposed work (20 %): Compulsory group work with a maximum of two students. It will be explained in the seminars.
- Written evaluation tests (60%): Theoretical and practical issues. A total of two, spread throughout the semester. The final grade for this activity will be the arithmetic mean of these tests, provided that there is no unit grade lower than 3 points. The tests will consist of two theory questions each contributing 10% and three problems contributing 80%.

2. Global final assessment test.

- Laboratory practices (20%): They will be carried out within the timetable of the split assessment.
- Proposed work (20%).
- Written exam (60%): There will be an exam corresponding to each of the exams taken by split assessment.

Each student will take the failed part or parts.

For those students who have failed the split assessment system, but some of their activities, with the exception of the written assessment tests, may be promoted to the global test of the final assessment, being able to be given the case of only having to make the written exam.