Universidad Zaragoza

Year : 2020/21

26922 - Thermodynamics

Syllabus Information

Academic Year: 2020/21
Subject: 26922 - Thermodynamics
Faculty / School: 100 - Facultad de Ciencias
Degree: 447 - Degree in Physics
ECTS: 6.0
Year: 3
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The teaching-learning methodologies proposed to achieve the objectives set and to acquire the skills are the following:

M1. Lectures: they present the student with the basic theoretical content to achieve the acquisition by the student of the specific competencies associated with CE1, CE2, CE3 and CE6, as defined in the report of verification of the Degree, section 3.2, page 34).

M2. Problem solving: it allows the acquisition of the competencies in concrete cases without the abstraction characteristic of pure theory. (CE1, CE2, CE6).

M3. Laboratory practices: these serve to compare the real world, with its practical limitations, with theory, which describes idealised situations. Also to take into account the limitations imposed by theoretical approaches, which do not always occur in the real world. The specific competencies to be achieved are CE7, CE8 and CE9.

M4. Autonomous works: they allow the assessment of the student, especially with regard to the specific competences CE1, CE2, CE6, and the general competences CG1, CG5, CG8.

M5. Examination of the subject: it allows the assessment of all the competences and objectives of the subject.

4.2.Learning tasks

The program is organized by chapters. Each chapter is structured as follows:

- Lectures: Each chapter is introduced in several lessons, in which the student is introduced to the general contents of the block.

- Practical sessions (problems): problems of application of the contents of the block are solved in class, both by the teacher and the students. Students must submit the assigned problems to the lecturer on the proposed dates.

- Assignment of works: The works are proposed on the contents of each chapter.

The organization by chapters is given in the syllabus of section 4.3.

Laboratory practices.

Practice 1: Measure of the vapor pressure of water below 100°C and determination of molar heat of vaporization. Determination of the adiabatic coefficient of air by means of a Flammersfeld oscillator.

Practice 2: Air Stirling cycle as a foundation of thermal machine and refrigerator.

The organization of the activities in presence hours is the following, according to the card of the Course 26922 "Thermodynamics", as it appears in the ?Plan de ordenación docente? of the Degree:

-T1, Lectures: 40 hours

-T2, Problems: 14 hours

-T3, Laboratory Practice, 5 hours

-T6 and T7 Jobs: 14 hours (non-presential)

-T7 Study: 71 hours (non-presential)

-T8, Assessment: 5 hours (face-to-face: 2 hours exposure + 3 hours exam, non-presential: 5 hours exam, with 30 minutes rest).

Total dedication 6 ECTS credits or a total of 150 hours (classroom and non-classroom) per student in a four-month period. The T1 and T2 activities imply an approximate dedication of 71 hours indicated as "study".

4.3.Syllabus

The course will address the following topics:

- Topic 1. Historical introduction to thermodynamics.
- Topic 2. The problem and the postulates.
- Topic 3. The conditions of equilibrium.
- Topic 4. Formal relationships.
- Topic 5. Sample systems.
- Topic 6. Processes and the maximum work theorem.
- Topic 7. Thermal engines.
- Topic 8. Alternatives formulations and Legendre transformation.
- Topic 9. Thermodynamic potentials.
- Topic 10. Maxwell relations.
- Topic 11. Stability of thermodynamic systems.
- Topic 12. Phase transitions.
- Topic 13. Properties of material.

4.4.Course planning and calendar

The schedule of the lectures will be as established by the Faculty of Science and will be announced in advance.

There will be 4 hours per week of classroom sessions. Three hours per week will be dedicated to theoretical contents and one to problem solving.

Calendar of laboratory practices: 1 session of 5 hours per student, in turns between the days indicated below.

Starting date: mid-November.

End: last week of December.

Submission of practice report: in January before the end of the class period

Examination dates:

To be decided by the Faculty Board.

4.5.Bibliography and recommended resources