Universidad Zaragoza

Academic Year/course: 2021/22

29612 - Technical Thermodynamics and Heat Transfer Basics

Syllabus Information

Academic Year: 2021/22
Subject: 29612 - Termodinámica técnica y fundamentos de transmisión de calor
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 430 - Bachelor's Degree in Electrical Engineering
ECTS: 6.0
Year: 2
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

About 17 Sustainable Development Goals (SDGs)

- (7) Affordable and Clean Energy (7.2, 7.3)
- (9) Industry, Innovation and Infrastructure (9.4)
- (11) Sustainable Cities and Communities (11.6)
- (12) Responsible Consumption and Production (12.2)

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The teaching process will be developed in four main activities: lectures, problem classes, lab, computer simulations and work (project, case)

- In the lectures, the fundamental theoretical bases on the subject will be exposed.

- In the classes of problems, the teacher will resolve cases that illustrate the application of theoretical concepts

- In practical sessions, students will resolve cases, either in the laboratory or by computer simulations (EES) in small groups, with the teacher's assistance during the session.

- Finally, the performance of one or more deliverables works will be carried out during the semester.

4.2. Learning tasks

The course includes the following learning tasks:

Classwork: 2.4 ECTS (60 hours)

1) Lectures (type T1) (30 contact hours). The concepts about engineering thermodynamics and heat transfer are presented, illustrated with real examples related to the degree profile. Student participation through questions is encouraged.

2) Classes of problems and resolution of cases (type T2) (15 contact hours). Problems and cases, temporarily coordinated

with the theoretical contents, will be developed.

3) Lab (type T3) (15 contact hours). The students will model the operation of equipment and thermal systems through real laboratory measurements or by simulations (Engineering Equation Solver EES) computer. Contents:

- Calculating properties of substances
- Open Systems Simulation
- Modeling power cycle steam turbine
- Modeling cycle gas turbine power
- Modeling vapor compression cycle (cooling and heating)
- Experimental characterization of operation of a refrigeration cycle
- Balance of energy in an electromagnetic brake
- Application of conduction analysis (buildings, electric wires, insulation of pipes and ducts)
- Improving heat transfer by fins.
- Experimental characterization of convective heat transfer in a tube bank
- Visit the installation of interest in relation to the subject. For example, DHC Expo, building CIEM, ...

Autonomous work: 3.6 ECTS (90 hours)

4) Work (case, project) (T6 type) (20 hours). Activities that the student will perform individually or in groups. Professor schedule tutoring sessions in order to track the performance of the groups and the progress made.

5) Study (type T7) (64 hours).

6) Evaluation tests (T8) (6 hours).

4.3. Syllabus

The course will address the following topics:

- Introduction to Thermodynamics: concepts and definitions.
- Calculation of properties of real substances.
- The first and second laws of thermodynamics.
- Power and cooling cycles.
- Basics of heat transfer: conduction, convection, and radiation.
- Heat conduction.
- Forced and natural convection.
- Heat exchangers.

4.4. Course planning and calendar

Lectures, problem classes, and practice sessions will be according to the schedule set by the center (schedules available on EINA website).

Each teacher will inform about hours of tutoring at the beginning of the semester.

The other activities will be planned according to the teaching assignment set according to the number of students enrolled and will be announced in advance.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29612&Identificador=13315