

29612 - Technical Thermodynamics and Heat Transfer Basics

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	430 - Bachelor's Degree in Electrical Engineering
ECTS	6.0
Course	2
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

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 of the subject will be exposed.

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

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

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

5.2.Learning activities

Class work: 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 to an installation of interest in relation to the subject. For example, DHC Expo, building CIEM, ...

non-contact 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).

5.3.Program

The contents developed are:

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

5.4.Planning and scheduling

Lectures, problem classes and practice sessions will be according to 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.

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5.5. Bibliography and recommended resources

Bibliography can be found in <http://psfunizar7.unizar.es/br13/eGrados.php?id=220>