

29612 - Technical Thermodynamics and Heat Transfer Basics

Información del Plan Docente

Academic Year	2017/18
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.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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

5.Methodology, learning tasks, syllabus and resources

5.1.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 of the subject will be exposed.

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

5.2.Learning tasks

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.Syllabus

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.Course planning and calendar

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

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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.

5.5. Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

- engel, Yunus A.. Termodinámica / Yunus A. Çengel, Michael A. Boles ; revisión técnica, Abraham Laurencio Martínez Bautista ... [et al.] . 8ª ed. Mexico [etc.] : McGraw-Hill Interamericana, D.L. 2015
- [BB] Çengel, Yunus A.. Transferencia de calor y masa : un enfoque práctico / Yunus A. Çengel ; revisor técnico Sofía Faddeva . 3ª ed. México D. F. : McGraw-Hill Interamericana, cop. 2007
- [BB] Incropera, Frank P.. Fundamentos de transferencia de calor / Frank P. Incropera, David P. DeWitt . 4a ed. México : Prentice Hall, 1999
- [BB] Marín Herrero, José María. Transferencia de calor / Jose Ma. Marín y Carlos Monné . 1a ed. Zaragoza : Kronos, 1998
- [BB] Moran, Michael J.. Fundamentos de termodinámica técnica / Michael J. Moran, Howard N. Shapiro . 2ª ed. en español, reimp. Barcelona [etc.] : Reverté, D. L. 2005

Listado de URL

- Herramientas informáticas. EES Manual. <http://www.fchart.com/> (ADD).[<http://www.fchart.com/>]