Heat-transfer Equipments

Academic Year: (2023 / 2024) **Review date: 20-12-2022**

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: GONZALEZ GOMEZ, PEDRO ANGEL

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Thermal Engineering
Heat Transfer
Power plants and Heat Engines

OBJECTIVES

At the end of this course, the student will be able to:

1.- Understand the theory related with heat and transfer processes in cooling towers and boilers.
2.- Apply their knowledge to identify, formulate and solve problems related with the design of cooling towers and boilers using the established methodology.
3.- Apply their knowledge to design cooling towers and boilers.
4.- Understand the use of different calculus methodology.
5.- Understand the techniques and methodology, and the limitations, applied to the design of cooling towers and boilers.

DESCRIPTION OF CONTENTS: PROGRAMME

This course is based on different heat exchanger devices and power plants. The program is divided in two parts:

FIRST PART: Selection and design of heat exchangers:
- Natural cooling tower
- Mechanical air-cooled cooling tower
- Mechanical wet cooling tower
- Evaporative cooler/condenser

SECOND PART: Boilers:
- Terms and definitions. Types of boilers
- Combustion reaction. Mass balance
- Energy balance. Efficiency. Adiabatic temperature

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology will include:
(1) Lectures, where the knowledge that students should acquire will be presented. To facilitate their development, students will receive class notes prior to the class for their reading and prior comprehension, as well as basic reference texts that will allow them to complete and deepen in those topics in which they are most interested.
(2) Proposal typical problems to work in class and joint resolution during the class to obtain the specific abilities that the students must develop.

Sharing of the answers to the exercises and joint correction should serve to strengthen knowledge and develop the ability to analyze and communicate the relevant information for solving problems. In addition, the sharing will favor the exchange of critical opinions both between teacher and students and between students.

ASSESSMENT SYSTEM

The evaluation criteria is as follows:

The mid-term exams could exclude that part in the final exam. A grade equal or higher than 5 is

mandatory to pass the course and, at least, a grade equal to 4 in each of the exams (mid-term/final).

Students who pass both mid-term exams:
- Lab 1 (continuous assessment): 25%
- Lab 2 (continuous assessment): 20%
- Mid-term exam 1 (continuous assessment): 35%
- Mid-term exam 2 (continuous assessment): 20%

Students who pass only one mid-term exam:
- Lab 1 (continuous assessment): 25%
- Lab 2 (continuous assessment): 20%
- Mid-term exam passed (continuous assessment): (1) 35% ó (2) 20%
- Mid-term exam failed (continuous assessment): (2) 5% ó (1) 10%
- Failed part final exam: (2) 15% ó (1) 25%

Students who failed both partial exams:
- Lab 1 (continuous assessment): 25%
- Lab 2 (continuous assessment): 20%
- Mid-term exam 1 (continuous assessment): 10%
- Mid-term exam 5 (continuous assessment): 5%
- Final exam 1: 25%
- Final exam 2: 15%

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- Barrie Jenkins, Peter Mullinger Industrial and Process Furnaces Principles, Design and Operation, Butterworth-Heinemann, 2008
- Detlev G. Kröger Air-cooled heat exchangers and cooling towers : thermal-flow performance evaluation and design, PennWell, 2004
- John H. Lienhard A heat transfer textbook, Phlogiston press, 2008
- Robert Serth, Thomas Lestina Process Heat Transfer, Academic Press, 2007