Machines and thermal engines

Academic Year: (2022 / 2023) **Review date: 31/05/2022 19:19:46**

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: LECUONA NEUMANN, ANTONIO

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Thermodynamics, Heat Transfer, Fluid Mechanics

OBJECTIVES

Knowledge and abilities for the design and analysis of thermal machines and engines, their processes and performances
Knowledge and abilities that allow understanding, analyzing, exploitation and managing the different sources, transformations, and consumptions of energy for thermal machines and engines, their sustainability characteristics, and sustainability and pollution figures.
Ability to model fluid-thermal processes

DESCRIPTION OF CONTENTS: PROGRAMME

Cap 1.- Internal combustion engines and the associated machines. Principles and performances. Technology. basic parameters.
Cap 2.- Thermochemistry of combustion. Properties. Results and pollutants.
Cap 3.- Open cycles for internal combustion engines. Detailed processes. Turbocharging and intercooling. Thermal processes of industrial interest.
Cap. 4.- Thermal turbines and the associated machines. Cooling. gas turbines and jet engines.
Cap 5.- Turbomachines. Principles.
Cap. 6.- Cycles of gas turbines. Processes and performances.
There is a detailed program available with the teaching material that expands and updates this information. It is published according to calender, academics available and laboratory and informatics available.

LEARNING ACTIVITIES AND METHODOLOGY

Teaching activities
- Theory conferences. Masterclasses. 1.3 ECTS.
- Quizzes and application exercises for comprehension of theory. 1.2 ECTS
- Practice in computer halls. And if there are resources, laboratory practice. 0.2 ECTS.
- Individual or group work. 0.3 ECTS, proposed by the professor on the topics developed in the classroom. Homework delivered as a report.

Teaching methodologies
- Masterclasses/lectures where the knowledge to be acquired by the student will be exposed. There will be class notes available and basic textbooks will be recommended both for following the subject and to continue knowledge downstream.
- Problem and question solving by the students for self-evaluation and to acquire the abilities required. Exposure and discussion of solving problems that are proposed to the students or proposed by them.
- Laboratory practicals, if available, and/or in computer halls, where the student can experiment with the concepts and results of the theory presented in the lectures.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	45
% of continuous assessment (assigments, laboratory, practicals…):	55

The assessment includes continuous evaluation and evaluation in exams where the general knowledge, abilities, and capacities will be evaluated.
The beforehand indicated percentages can vary, depending on the extension and/or difficulties of the home works used for the evaluation within the ranges 40-70% for the continuous part and 60-30% for the final part in a written exam. Over 14 points.
It is posible to pass if the continuous evaluation is passed.
Basic scheme:
The laboratory practicals are 1/15 of the final mark. Compulsory.
A first partial exam will count as a number of theoretical sessions/14 of the theory mark.
A second partial exam (part) will be performed at the final date counting as the remaining theoretical sessions/14.
Delivering homework and participating during the lectures can improve the mark after having passed the described marks (50% of the maximum).
In the final exams, it is possible to improve the grading of both partial exams of continuous evaluation.
If the practicals have been passed the previous course, it is possible to validate them with just pass, asking for it to the practicals coordinator.

BASIC BIBLIOGRAPHY

- Heywood Internal Combustion Engine Fundamentals, McGraw-Hill, 1988

- Lecuona, A. Máquinas y Motores Térmicos (varios capítulos), OCW Universidad Carlos III de Madrid, 2018

- Lecuona, A. et al. Motores Térmicos, OCW Universidad carlos III de Madrid, 2014

- Moran; Shapiro Fundamentos de Termodinámica Técnica, Reverté, 2004

- William C. Reynolds (Author), Piero Colonna Thermodynamics: Fundamentals and Engineering Applications, Cambridge University Press, 2018

ADDITIONAL BIBLIOGRAPHY

- Payri F., Desantes, M. Motores Alternativos de Combustión Interna, Reverté, 2012

BASIC ELECTRONIC RESOURCES

- Lecuona et al. . Motores Térmicos: http://ocw.uc3m.es/ingenieria-termica-y-de-fluidos/motores-termicos