Universidad Zaragoza

Year : 2019/20

29736 - Combustion Engines

Syllabus Information

Academic Year: 2019/20
Subject: 29736 - Combustion Engines
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 434 - Bachelor's Degree in Mechanical Engineering
ECTS: 6.0
Year: 4
Semester: First semester
Subject Type: Optional
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as:

- 1. Lectures were given to the entire group. The professor will explain the basic principles of the subject and solve real problems in some representative cases. In parallel, the student must perform personal work of study.
- 2. Laboratory practices which are distributed throughout the semester. The work will be evaluated and will be part of the final grade for the course. Practices are held in small groups.
- 3. Tutored work in small groups (couples ideally): students solve a problem of the actual application.
- 4. Additional proposals of exercises, questions and problems. This encourages autonomous work for the resolution of the exercises.
- 5. Academic tutoring: Professor procedures in place to pose and resolve the student doubts.

4.2.Learning tasks

The course includes the following learning tasks:

- 1) Lectures (type T1) (30 hours face-to-face). Exposition sessions of theoretical and application contents. The concepts and fundamentals of the internal combustion engines will be presented, illustrating them with real examples adapted to the profile of studies. Student participation will be encouraged through questions and

participation in problem solving.

- 2) Problem & solving sessions (type T2) (15 hours face-to-face). Problems and cases will be developed with the participation of the students, coordinated temporarily with the theoretical contents. The student will be encouraged to work on the problems in advance, for which he will have the statements and the guidelines for their resolution.
- 3) Laboratory sessions (type T3) (15 hours face-to-face). The student will understand the operation of the internal combustion engines by direct contact with the components and systems in the laboratory. The student will make a script of each session highlighting the fundamental aspects developed in it. The sessions will include the following contents:
    - Description of internal combustion engine components.
      ? Identification of engine components and auxiliaries. Description of a test bench.
      ? Dismantling and assembly of an internal combustion engine.
      ? Air-fuel ratio requirements of an engine. Fundamentals of spark ignition.
      ? Advanced injection and ignition control systems.
      ? Tools for the verification and set-up of ignition and electronic injection systems.
- 4) Assignments (type T6) (20 hours). Activities that the student will carry out in small groups of 2 or 3 people and that the teaching staff will propose throughout the teaching period. Periodically the teaching staff will schedule tutorial sessions with the purpose of controlling the progress of the work.
- 5) Autonomous work (type T7) (64 hours). Student's autonomous work of the theoretical part and realization of problems. The student's continuous work will be encouraged through the homogeneous distribution of the various learning activities throughout the term. This section also includes the tutorials, such as direct attention to the student, Identification of errors in learning, orientation in the subject, attention to exercises and work ...
- 6) Assessments (type T8) (6 hours). In addition to the evaluating function itself, assessment is also a learning tool in which the student checks the degree of understanding and assimilation achieved.

4.3.Syllabus

The course will address the following topics:

- Introduction. Comparison of actual tendencies on design and application of internal combustion engines.
- Real cycles. Determination and interpretation.
- Definition of fundamental engine parameters: geometrical and operating.
- Engine performance curves and their analysis.
- Similarity laws for four-stroke engines.
- Principles of gas exchange processes.
- Exhaust process. Silencer elements.
- Fuel characteristics.
- Combustion process. Characteristic and influence factors.
- Engine emissions and treatment systems.
- Mechanical and heat losses. Cooling and lubrication.
- Principles of supercharging.

4.4.Course planning and calendar

The lectures, problems and laboratory sessions are given according to the schedule established by the center (schedules available on its website).

The teacher will publish the tutorials schedule on the center's website at the beginning of the course

The rest of the activities will be planned according to the established teaching order, according to the number of students, and will be announced well in advance.

4.5.Bibliography and recommended resources