29728 - Thermal Machines and Engines

Syllabus Information

Academic Year: 2020/21
Subject: 29728 - Thermal Machines and Engines
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 434 - Bachelor's Degree in Mechanical Engineering
ECTS: 6.0
Year: 3
Semester: Second semester
Subject Type: Compulsory
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. It is based on participation and the active role of the student favours the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, guided assignments, laboratory sessions, autonomous work, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

4.2.Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.8 ECTS): 45 hours.

- Laboratory sessions (0.6 ECTS): 15 hours.

- Guided assignments (0.6 ECTS): 15 hours.

- Autonomous work (2.4 ECTS): 60 hours.

- Tutorials (0.6 ECTS): 15 hours.

Lectures: the professor will explain the theoretical contents of the course and solve illustrative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the semester. Lectures run for 3 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended.

Laboratory sessions: sessions will take place every 2 weeks (5 sessions in total) and the last 3 hours each. Students will work together in groups actively doing tasks such as practical demonstrations, measurements, calculations, and the use of graphical and analytical methods.

Guided assignments: students will complete assignments, problems and exercises related to concepts seen in laboratory sessions and lectures. They will be submitted at the beginning of every laboratory sessions to be discussed and analyzed. If assignments are submitted later, students will not be able to take the assessment test.

Autonomous work: students are expected to spend about 60 hours to study theory, solve problems, prepare lab sessions, and take exams.

Tutorials: the professor's office hours will be posted on Moodle and the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

4.3.Syllabus

The course will address the following topics:

1. Introduction to thermal engines and machinery
2. Thermodynamic cycles in internal combustion (IC) engines
3. Systems and components in IC engines. Design and performance parameters.
4. Applications and performance maps for SI engines
5. Compressible flow. Nozzles and diffusers. Jet propulsion. Rotodynamic machinery. Euler equation. Velocity diagrams.
6. Impulse and reaction turbines. Losses in turbines.
7. Compressors: types, characteristics and selection criteria.
8. Application of thermal engines and machinery to power generation
9. Combined heat and power (cogeneration)
10. Selection and optimization of thermal engines and machinery in power generation systems

4.4.Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course please refer to the "Escuela de Ingeniería y Arquitectura " website (https://eina.unizar.es/)

4.5.Bibliography and recommended resources