

60826 - Safe and sustainable mobility

Syllabus Information

Academic year: 2024/25

Subject: 60826 - Safe and sustainable mobility

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 532 - Master's in Industrial Engineering

ECTS: 6.0

Year: 2

Semester: Second semester

Subject type: Optional

Module:

1. General information

The objectives are for the student to acquire the ability to study, analyse and understand the aspects that are necessary for the design and calculation of safe and efficient transportation systems. Engineering topics related to automotive engineering will be used.

The design of active and passive security systems, their relationship with the reduction of accidents, the design of efficient traction systems that reduce emissions and consumption, the design of rational uses of the vehicle in urban and interurban environments that reduce accidents and optimize the route and therefore improve its sustainability.

SDGs

Goal 7: Affordable and Clean Energy

Goal 9: Industry, Innovation and Infrastructure.

Goal 11: Sustainable Cities and Communities.

Goal 13: Climate action.

2. Learning results

Upon completion of the subject the student will be able to:

- Acquire analytical skills to determine the safe behaviour of vehicles in the event of an accident as well as the human behaviour in driving.
- Acquire analytical skills to determine the mechanical, electrical, and energy behaviour of machines and vehicles in efficient use in urban and interurban environments that allow to establish the keys for sustainable vehicle designs.
- Acquire practical skills for the application of experimental methodologies in the analysis of accident rates, their causes and their direct consequences in prevention.
- Acquire practical skills for the application of experimental methodologies for the analysis, design and calculation of machines and vehicles with features specially designed to be sustainable.
- Analyse the structural behaviour of machines and vehicles and their components: introduction, methodologies and structural resolution tools.
- Apply advanced numerical calculation methods to the virtual solving of problems. Use accident simulation programs, vehicle performance programs, vehicle design and component programs, consumption and emission programs, driving behaviour programs, vehicle utilization optimization programs and work on application examples.
- Design methodology based on the combination of simulation techniques and test execution. General aspects, result analysis, model validation.
- Design, calculate and optimise vehicle component systems and their integration to ensure their safety and sustainability.
- Formulate and solve specific cases applying numerical tools based on different mathematical algorithms.

Anyone who holds a master's degree in industrial engineering by the University of Zaragoza is considered as sufficiently prepared to enter the Automotive Engineering sector. For this reason, one of the objectives to be achieved in this subject is for the students to have the necessary basic knowledge to work in the automotive sector. It should be noted that the necessary technology to work in these companies requires a clear understanding of the systems and components that make up a vehicle, its operation, design methods, calculation and testing. This will be the level of knowledge transmitted to the student during the teaching of the subject. In addition, the students will work in groups and with real data, so they will also develop team collaboration skills in solving real problems.

3. Syllabus

Safe Mobility Module. It will cover the following topics:

1. Accidents within the framework of sustainable mobility.
2. Determination of the causes of traffic accidents in urban and interurban environments.
3. Impacts on accidents due to the introduction of new sustainable transportation methods
4. Preventive plans for traffic accidents

Sustainable Mobility Module; It will cover the following topics:

1. Intelligent, efficient and sustainable transportation and mobility systems.
2. Non-polluting vehicle technology.
3. Performance and sizing of electric vehicles.
4. Efficient mobility in urban and suburban environments

4. Academic activities

The proposed methodology aims to encourage the student's continuous work and focuses on the theoretical-practical aspects and understanding of the vehicle's behaviour and its driving in shared circulation environments, reinforcing aspects related to the calculation and optimization of safe and sustainable vehicles.

There will be master classes with the whole group of students. In them, teachers will explain theoretical and descriptive aspects of the studied systems.

There will also be practical classes where real situations about vehicles and type of driving will be analysed in order to optimise component systems through numerical and experimental techniques.

5. Assessment system

1. Written exam, including theoretical questions and numerical problems related to the syllabus and the practices carried out.
2. Two works: one related to the Individual Sustainable Mobility Module and another related to the Safe Mobility Module. They can be done either individually or in a group. These works will include a theoretical-practical development of the topics covered in the subject.
3. Completion of 3 laboratory practices and the mandatory reports. If the student completes these, they will not need to sit for the global test.

Global test. Students who do not complete any of the sections proposed above (2 or 3) must take the global test in the official call for exams. The global test will be a single and written test and will be held on the same date as the written test of the subject (1) however with a longer duration.

The written test (1) accounts for 50% of the final grade, and the two assignments make up the other 50% of the subject. To average with the assignment grade, the student must obtain a grade of at least 3.5 out of 10 on the written test.

To pass the subject, the student must obtain a final grade of at least 5 points out of 10.

On the other hand, the second call for exams will be carried out through a comprehensive test conducted in the period established for this purpose in the academic calendar.

6. Sustainable Development Goals

- 7 - Affordable and Clean Energy
- 9 - Industry, Innovation and Infrastructure
- 11 - Sustainable Cities and Communities