

## 30052 - Railways and Other Guided Vehicles

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 30052 - Railways and Other Guided Vehicles

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 436 - Bachelor's Degree in Industrial Engineering Technology

**ECTS:** 6.0

**Year:** 4

**Semester:** First semester

**Subject type:** Optional

**Module:**

### 1. General information

The objective of the subject is first of all to provide the student with a solid theoretical basis in the following fields of railway knowledge:

- Railway installations (track, electrification, signaling, blocking-communication, terminals).
- Rolling stock (traction equipment, types of vehicles, elements and components of traction systems, electronic control systems in vehicles, train units, passengers, freight and maintenance).
- Cross-cutting issues: Interoperability and sustainability in rail transport, operation and railway policies. Secondly, the aim is for the student to be able to develop a project that is coherent with the knowledge acquired.

SDGS

7. Affordable and non-polluting energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
11. Sustainable Cities and Communities
13. Climate Action

### 2. Learning results

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

- Reasoned and technically sound analysis of the various railway issues
- To elaborate documentation and projects in the railroad environment.
- To develop their professional career in the railway sector, one of the most demanded profiles.

The student will be competent in the analysis of the installations and systems present both on the track and in the terminal. They will deepen their knowledge of railway rolling stock in its different typologies; urban, interurban, conventional, high speed and freight. Likewise, the student will be familiar with the main techniques of railway operation and as well as the regulatory and legal framework of the railway sector.

The learning results of this course provide students with the ability to analyze real industrial process control situations and enable them to propose schemes and calculate the appropriate control parameters to meet given requirements, as well as to propose solutions for improvement and efficiency in an existing process control. These results, and the capabilities and skills derived from them, are of great importance in the industrial environment, where process control is a key and fundamental piece for product development, allowing to reduce costs, both economic and environmental, and to increase the final quality of the product.

### 3. Syllabus

- 1- Historical introduction. Origins and evolution.
- 2- Introduction. Equation of motion. Interaction between locomotives, rolling stock and infrastructure.
- 3- Types of traction. Steam. Diesel. Turbomotors. Electric traction (alternating-direct current). Magnetic levitation.
- 4- Theory of movement. Traction. Resistance and stress. Adherence. Braking. Aerodynamics. Transmission
- 5- Locomotives. Electrical and mechanical parts.
- 6- Infrastructure. The track and track devices: turnouts and crossings. Ballast and ballastless track. Signage. Interlocks. Security. Contact line. Return circuit. Substations. Stations. Terminals.
- 7- Other guided vehicles. Tramway. Metro. High speed. Magnetic levitation train. Funicular. Zipper. Hyperloop. Other guided vehicles based on positional guidance with sensors.

#### **4. Academic activities**

1. Lecture, teaching of theoretical concepts and problem solving with application examples.
2. Development of 5 laboratory practices to observe in a practical way what was exposed during the lectures.
3. Development of an individual work with teacher's follow-up. In order to consolidate the acquired knowledge a practical work will be developed, which must be presented and defended in class.
4. Talks by professionals from the railway sector.
5. Visits to railway facilities. (Stations and terminals. Regulation and control centers. Rolling stock factories. Railway infrastructure)

#### **5. Assessment system**

To pass the subject the student must take a written exam (50% of the final grade), and the development and defense of an individual paper from among those proposed at the beginning of the term (50% of the final grade).

1. Examination. Individual written test (50%). Graded between 0 and 10 points (CT). Students must demonstrate their knowledge and skills by answering theoretical and practical questions. It will consist of theoretical questions and numerical problems to be solved.
2. Work. Development of the work and its presentation (50%). Graded between 0 and 10 points (CP), it may be passed during the term.
3. Perform the laboratory practices and submit the corresponding reports.

It is an essential condition for passing the subject:

- obtain CT and CP scores both greater than or equal to 3.5 points. Only in that case, the overall grade of the subject will be  $(0.50*CP + 0.50*CT)$ . The subject is passed with an overall grade of 5 out of 10.
- to have completed all the laboratory practicals proposed at the beginning of the term and to have submitted the corresponding reports for each of the practicals carried out.

#### **6. Sustainable Development Goals**

- 7 - Affordable and Clean Energy
- 9 - Industry, Innovation and Infrastructure
- 12 - Responsible Production and Consumption