

Academic Year/course: 2021/22

## 30052 - Railways and Other Guided Vehicles

### Syllabus Information

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**Academic Year:** 2021/22

**Subject:** 30052 - Ferrocarriles y otros vehículos guiados

**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

### 1.1. Aims of the course

The subject and its expected results respond to the following approaches and objectives:

The aim of the course is firstly to provide the student with a solid theoretical basis in the following fields of rail knowledge:

- ? Railway Facilities (on track, electrification, signaling and blocking, communication).
- ? Rolling stock (traction material, vehicle types, elements and components of traction systems, electronic control systems for functions in vehicles, train units, passengers, goods and maintenance).
- ? Cross-cutting themes: Interoperability and sustainability in rail transport, rail operation and policies.

Secondly, it is sought that the student is able to develop a project consistent with the knowledge acquired.

### 1.2. Context and importance of this course in the degree

As a result the student will present some technical knowledge that will allow him to develop documents and railway projects. The student will have a sufficient knowledge base to start a professional career in the rail transport sector.

### 1.3. Recommendations to take this course

It is necessary that the student has knowledge in electricity and mechanics. This knowledge is basic for the correct comprehension of the different systems present in the railway systems and guided systems in general, thus favoring the assimilation of the concepts exposed.

## 2. Learning goals

### 2.1. Competences

By passing the subject, the student will be more competent to ...

- ? Analyze reasonably and with technical strength the different railway problems
- ? Prepare documentation and projects in the railway environment.
- ? To develop his professional career in the railway sector, one of the profiles most demanded.

### 2.2. Learning goals

The student, to overcome this subject, must demonstrate the following results ...

The student will be competent for the analysis of the facilities and systems present both in the way and Terminal

It will deepen the knowledge of railway rolling stock in its different typologies; Urban, intercity, conventional, high speed and goods.

Likewise, the student will be familiar with the main techniques of railway operation as well as the legal and regulatory framework of the railway sector.

### 2.3. Importance of learning goals

The learning results of this subject provide the student with the ability to analyze real situations of industrial process control

and enable him to propose schemes and calculate the adequate control parameters that allow to meet given requirements, as well as to propose improvement solutions And efficiency in an existing process control. These results, and the skills and abilities derived from them, are of great importance in the industrial environment, where process control is a key and fundamental element for the development of the product, allowing to reduce costs, both economic and environmental, and increase the Final quality of the product.

### 3. Assessment (1st and 2nd call)

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

The student must demonstrate that he / she has achieved the expected learning outcomes through the following assessment activities

Individual written test (50%). Rated between 0 and 10 points (CT). Students must demonstrate their knowledge and skills by answering theoretical-practical questions.

Evaluation of the project and its presentation (50%). Qualified between 0 and 10 points (CP), can be overcome during the course.

For the passing of the subject is essential condition to obtain a CT and CP marks both greater than or equal to 3.5 points. Only in this case, the overall grade of the subject will be  $(0.50 * CP + 0.50 * CT)$ . The subject is surpassed with an overall grade of 5 points out of 10.

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. Methodological overview

The learning process that is designed for this subject is based on the following:

1. Lecture and examples of practical application.
2. The development of practices done by students, so that they can observe practical applications during lectures.
3. Development of a individual or a group project. To consolidate the knowledge acquired, the students will develop a practical project which must be exposed and defended in class.
4. Talks by professionals and visits to railway facilities.

#### 4.2. Learning tasks

The program that the student is offered to help you achieve the expected results includes the following activities ...

Lecture and examples of practical application. The contents developed are related with the following subjects:

- Railway Facilities (in track, electrification, signaling and blocking, communication).
- Rolling stock (traction material, vehicle types, elements and components of traction systems, electronic control systems functions in vehicles, train units, passengers and freight, and maintenance).
- Cross-cutting themes: Interoperability and sustainability in rail transport, mining and railway policies.

Laboratory practices. For the realization of the practices are available the following laboratories:  
Lab computers to perform calculations and simulations.

The students have the possibility to perform their practices in a remote way using the specific software.

Development of individual or a group project, whereby the student show and will value the knowledge acquired.

Professional lectures and visits to railway facilities, will be scheduled, thus providing students an overview of the opportunities for professional development within the rail sector

#### 4.3. Syllabus

The program content of the subject is as follows:

- 1- HISTORICAL INTRODUCTION
  - 1.1 ORIGINS OF RAILWAY
  - 1.2 DIESEL TRACTION
  - 1.3 ELECTRICAL TRACTION
- 2- INTRODUCTION
  - 2.1 TYPES OF TRACTION
  - 2.2 EQUATION OF MOTION
  - 2.3 RAIL LOCOMOTIVES
  - 2.4 INFRASTRUCTURE
- 3- TYPES OF TRACTION
  - 3.1 DIESEL TRACTION
  - 3.2 TRACTION BY TURBINE ENGINE
  - 3.3 TRACTION ELECTRIC

- 3.3.1 DC
- 3.3.2 With single phase alternating current
- 3.3.3 With three-phase AC
- 3.3.4 Comparison diesel electric front
- 4- THEORY OF MOVEMENT
- 4.1 TRACTION
- 4.2 STRENGTH, EFFORTS AND VIRTUAL LENGTHS
- 4.2.1 STRENGTH
- 4.2.2 EFFORTS
- 4.2.3 VIRTUAL LENGTHS
- 4.3 ADHERENCE
- 4.3.1 DEFINITIONS
- 4.3.2 FACTORS INFLUENCING ADHERENCE
- 4.4 BRAKING
- 4.4.1 TRAIN BRAKING
- 4.4.2 BRAKE SYSTEMS
- 4.5 AERODYNAMICS
- 4.6 TRANSMISSION
- 5- RAIL LOCOMOTIVES
- 5.1 ELECTRICAL PART
- 5.2 MECHANICAL PART
- 6 INFRASTRUCTURE
- 6.1 PATHWAY
- 6.1.1 PARTS OF THE ROAD
- 6.1.2 TURNOUTS: TURNOUTS AND CROSSINGS
- 6.1.3 THE SLAB TRACK
- 6.2 SIGNALLING
- 6.2.1 SIGNALLING SUBSYSTEMS
- 6.2.2 INTERLOCKS
- 6.2.3 SAFETY SYSTEMS FOR SIGNALING AND LINE CONTROL
- 6.3. FOOD
- 6.3.1 CONTACT LINE
- 6.3.2 CIRCUIT RETURN
- 6.3.3 INFLUENCE OF THE CONTACT LINE AND THE RETURN CIRCUIT
- 6.4 SUB STATIONS
- 6.4.1 TYPES OF SUBSTATIONS
- 6.4.2 SUBSTATIONS IN SPAIN
- 6.5. STATIONSS
- 6.5.1 TYPES OF STATIONS
- 6.5.2 DRAFT STATION
- 7 OTHER VEHICLES DRIVEN
- 7.1 THE TRAM
- 7.2 METRO
- 7.3 HIGH SPEED TRAINS

#### **4.4. Course planning and calendar**

##### **Scheduling sessions and presentation of works.**

The schedule of the course for classroom sessions and practical lab classes are fixed by the EINA. Complementary activities, such as lectures and technical visits, which can be done during the course will be announced in advance.

The academic calendar of the activities to be developed in the subject can be consulted on the website of the center. The student must be attentive to the detailed dates of accomplishment of practices and delivery of works of which will be conveniently informed by the channels that the professor will facilitate.

#### **4.5. Bibliography and recommended resources**

Link:

[http://biblos.unizar.es/br/br\\_citas.php?codigo=30052&year=2019](http://biblos.unizar.es/br/br_citas.php?codigo=30052&year=2019)