

Course guide

340710 - TEFE - Railway Technologies

Last modified: 28/04/2025

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2018). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: Lluís Monjo Mur

Others:

PRIOR SKILLS

It is not necessary any previous knowledge.

REQUIREMENTS

There is no previous requirements.

TEACHING METHODOLOGY

The subject is based on active methodologies and challenges during the semester. There will be also expositive sessions.

LEARNING OBJECTIVES OF THE SUBJECT

Railway systems are a key element in the mobility of people and goods. Furthermore, they become the best example of electrified and efficient transportation in the energy transition. The subject's objective is to know the basic concepts that allow this system to function, from its regulation and organization to the different technological systems (civil, electromechanical, communications, etc.) that enable mobility and their management methods.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	30.00
Hours small group	15,0	10.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Railways system introduction

Description:

1. The railway as a system. Basic concepts, subsystems and interrelationships.
2. Organization of the railway system
3. The railway in the world.

Full-or-part-time: 14h

Theory classes: 4h

Laboratory classes: 3h

Self study : 7h

Services types

Description:

1. Local, regional, metro and tramways.
2. High speed and long distance services.
3. Transport of goods.

Full-or-part-time: 20h

Theory classes: 4h

Guided activities: 6h

Self study : 10h

Civil work

Description:

1. Platform and track
2. Stations
3. Exchangers
4. Bridges, tunnels and gauges
5. Width changers

Full-or-part-time: 12h

Theory classes: 4h

Laboratory classes: 2h

Self study : 6h

Railway traction

Description:

1. Physical principles of traction
2. Mechanical transmission
3. Electric traction motors
4. Diesel-electric traction motors

Full-or-part-time: 32h

Theory classes: 4h

Laboratory classes: 6h

Guided activities: 6h

Self study : 16h



Energy systems

Description:

1. Energy and transport
2. Energy needed to move a train
3. Technologies for braking
4. Ecodriving
5. Catenary and substations

Full-or-part-time: 32h

Theory classes: 6h

Laboratory classes: 4h

Guided activities: 6h

Self study : 16h

Communications and protection technologies

Description:

1. Security and locking systems
2. ATP, ATO and ATC systems
3. Train-land communications

Full-or-part-time: 16h

Theory classes: 4h

Laboratory classes: 4h

Self study : 8h

Line management

Description:

1. Technical exploitation of the railway
2. Railway schedule

Full-or-part-time: 24h

Theory classes: 4h

Laboratory classes: 4h

Guided activities: 4h

Self study : 12h

GRADING SYSTEM

Challenges (50%)

Works (30%)

Exam (20%)

BIBLIOGRAPHY

Basic:

- Fuentes Losa, Julio; González Fernández, Francisco Javier. Ingeniería ferroviaria [on line]. Segunda edición. Madrid: Universidad Nacional de Educación a Distancia, 2010 [Consultation: 13/09/2024]. Available on: <https://lectura.unebook.es/viewer/9788436261844/1>. ISBN 9788436260748.
- Ihme, Joachim. Rail vehicle technology [on line]. Wiesbaden, Germany: Springer, 2022 [Consultation: 13/09/2024]. Available on: <https://link.springer.com/book/10.1007/978-3-658-36969-9>. ISBN 9783658369699.
- Fraile Mora, Jesús. Máquinas eléctricas [on line]. 8a ed. Madrid: Ibergarceta, 2016 [Consultation: 13/09/2024]. Available on: https://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4137. ISBN 9788416228669.
- Guerrieri, Marco. Fundamentals of railway design [on line]. Cham, Switzerland: Springer, 2023 [Consultation: 13/09/2024]. Available on: <https://link.springer.com/book/10.1007/978-3-031-24030-0>. ISBN 9783031240300.
- Hansen, Ingo A; Pacht, Jörn; Albrecht, Thomas. Railway timetabling and operations : analysys, modelling, optimisation, simulation, performance evaluation . 2nd revised and extended edition. Hamburh : Eurailpress, 2014. ISBN 9783962450892.

Complementary:

- Jablonski, Adam ; Jablonski, Marek. Digital safety in railway transport aspects of management and technology [on line]. Cham, Switzerland: Springer, 2022 [Consultation: 13/09/2024]. Available on: <https://link.springer.com/book/10.1007/978-3-030-96133-6>. ISBN 3-030-96133-8.
- Kiessling, Friedrich. Contact lines for electric railways : planning, design, implementation, maintenance. Erlangen: Publicis, 2009. ISBN 9783895783227.