

## EcoRail23

### Course for Higher Technician for the maintenance and sustainable development of railway systems

<http://www.itsprime.it/corsi/nuovi-corsi/ecorail23-pistoia/>

#### Type of course:

two-year course after secondary school Diploma or after the 4-year Diploma of Vocational Education and Training (VET) integrated by a one-year Higher Technical Education and Training (IFTTS) course.

#### Teaching location:

the course will take place mainly at the headquarters of **Uniser, Via S. Pertini 358 Pistoia**. Part of the activities may be held in the technological laboratories of the universities, companies and entities that collaborate with the ITS Prime Foundation. They may also be held occasionally in facilities of educational or scientific interest located elsewhere. The internships can take place in companies located in any part of the regional, national and/or European territory.

**Registration deadline:** November 15, 2023

#### Type of final Diploma:

Diploma in "HIGHER TECHNICIAN FOR AUTOMATION AND MECHATRONIC SYSTEMS" (Area 4.3 Mechanical System - Figure 4.3.2 of Annex D - Interministerial Decree 07/09/2011) with indication of specialization of the course in "**COURSE FOR HIGHER TECHNICIAN FOR THE MAINTENANCE AND SUSTAINABLE DEVELOPMENT OF RAILWAY SYSTEMS**" with the certification of skills corresponding to the fifth level of the European Qualifications Framework - EQF.

In order to facilitate circulation at national and European level, the certificate is accompanied by EUROPASS certification.

#### Entry requirements:

possession of secondary school diploma or after the 4-year Diploma of Vocational Education and Training (VET) integrated by a one-year Higher Technical Education and Training (IFTTS) course;

age between 18 to 35 years (not completed on the call deadline date);

basic skills in English and ICT.



Female candidates and/or candidates belonging to disadvantaged categories who have been successful in the selection process will be automatically admitted to participate in the course as trainees, up to the limit of the number of places allocated to them (50% of places to women, 7% to disadvantaged categories in accordance with the provisions of Law 68/1999).

**Type of access:**

programmed number: 25 students

**Selection mode**

The selection of participants includes:

curricular evaluation by qualifications and experiences,  
a written test,  
a motivational interview.

**Method of enrollment:**

see link: <http://www.itsprime.it/corsi/nuovi-corsi/ecorail23-pistoia/>

**Methods of recognition of previous training courses:**

The student at the time of enrollment may request the recognition of training courses, formal or non-formal, producing the documentation that attests them. The request is submitted to the judgement of the Scientific Technical Committee that evaluates the coherence of the previous training courses with the Training Units and the modules of the course that the student is going to attend. On this basis the Scientific Technical Committee indicates which modules can be recognized as already learned by the student. Requests for recognition of training credits received after the selection date will not be evaluated.

**Profile of the course**

The “HIGHER TECHNICIAN FOR THE MAINTENANCE AND SUSTAINABLE DEVELOPMENT OF RAILWAY SYSTEMS” deals with the design of systems and rolling stock according to the sustainability principles of Ecodesign and industrialises their production in compliance with the design standards required by the LCC (Life Cycle Cost) paradigm.

**Main expected learning outcomes**

The **EcoRail23** graduate has the competence to

- combine different technologies, from mechanics to electronics to information technology, which enable him/her to intervene in the entire production chain: from the study of the project, to the use of representation and simulation software to techniques for processing materials;



- know the design, prototyping and industrialisation techniques for mechanical products (CAD, CAD 3D, CAM, FEM, etc.); act in the construction, testing and documentation of production processes
- know innovative materials and their processing procedures; can manage the production of mechanical components using additive manufacturing (AM) techniques;
- know how to programme industrial automation systems (PLC, CNC numerical control machines, etc.) and apply testing, commissioning and fault-prevention methods;
- manage production flows in their planning, control and cost-effectiveness (LEAN);
- researching and applying technical and safety regulations in the electrical, electronic and mechanical fields;
- intervene in the marketing phase by managing after-sales and system maintenance requirements.

### **Didactic plan**

The two-year course, of 1800 hours in total, takes place in 4 semesters with a didactic articulation that provides:

classroom lessons and laboratory activities (1100 hours), internship, in Italy and abroad (700 hours). Any foreign internships are carried out with the European Erasmus+ programme.

Lesson time: from a minimum of 4 to a maximum of 8 hours per day.

The entire training course is carried out in close connection with the mechanic sector companies. The teaching team is composed of at least 50% of experts from the world of production, professions and work with a specific professional experience in the field. In particular is involved the staff of the companies partners of ITS Prime Foundation.

Teachers from the School, University, Research Centres and Vocational Training will also be involved. Seminars, testimonies of key protagonists in the sector and visits to fairs, events, companies and installations of particular interest will complete the path of studies.

### **Possibility of access to further studies**

The diploma may be integrated into a subsequent university course, with recognition of university credits (CFU) on the basis of the didactic regulations of the individual universities. In this regard, please refer to the regulations in force.

### **Regulations for the conduct of exams and other forms of school profit assessment**

Each ITS PRIME course is biennial and consists of Training Units, divided into Didactic Modules.

At the end of each Didactic module, a 100-scale assessment is planned. For the modules with many hours of lessons, intermediate verifications are foreseen. Students, after having attended the course for at least 80% of the total hours of lessons, and having obtained in all the Didactic modules at least 60/100, are admitted to take the final exam. The exam consists of a written test with multiple choice tests, a technical-practical test, an interview. The fundamental part of interview is the discussion of a work experience, designed and



prepared during the internship period. By passing the exam, students acquire the Diploma of Higher Technician, a qualification corresponding to the 5st level of the European Qualifications Framework EQF

## **Course structure**

### **Training Units and Teaching Modules**

#### UFC 1 - EMPOWERMENT AND TEAM BUILDING

- 1.1 Outdoor Training
- 1.2 Self Empowerment and Team Building Workshop
- 1.3 Problem setting and solving - decision making - time management

#### UFC 2 - ORIENTATION TOWARDS WORK AND ENTERPRISE

- 2.1 The enterprise and the employment relationship (contracts)
- 2.2 Company organisation and organisation charts
- 2.3 Order management techniques
- 2.4 Supply Chain Management

#### UFC 3 - LANGUAGE SKILLS

- 3.1 English Theory
- 3.2 English Laboratory
- 3.3 Technical English

#### UFC 4 - QUALITY, SAFETY AND ENVIRONMENT

- 4.1 Quality policies in the use of processes (ISO 9001)
- 4.2 Safety and accident prevention in the workplace
- 4.3 Green enterprise; iso 14000 and eco-compatibility of industrial production

#### UFC 5 - ADVANCED TECHNOLOGIES FOR RAILWAY MAINTENANCE

- 5.1 Computer Aided Design
- 5.2 Parametric Solid Modelling
- 5.3 BIM (Building Information Modeling) and link with design
- 5.4 Rapid prototyping and reverse engineering
- 5.5 Virtual, augmented and simulation reality techniques
- 5.6 CBM (Condition Based Monitoring)
- 5.7 Remote measurement for civil works (integrated stations)

#### UFC 6 - INTRODUCTION TO RAILWAYS (IN ENGLISH)

- 6.1 Rolling Stock and Safety Bodies
- 6.2 Infrastructure and Safety Organs
- 6.3 Signalling and safety organs



## UFC 7 - MECHANICAL DESIGN AND VALIDATION

- 7.1 Mechanical design and ecodesign principles
- 7.2 Numerical analyses and simulations for design validation
- 7.3 Design Documentation
- 7.4 From Design to Product
- 7.5 The validation of railway vehicles

## UFC 8 - THE RAIL SYSTEM: VEHICLES

- 8.1 Types of rail vehicles
- 8.2 Architecture of rail vehicles
- 8.3 Constituent elements of railway vehicles
- 8.4 MV0 - General skills related to the maintenance process (ANSFISA recognised course)
- 8.5 MV1 - Running-in and related maintenance activities (ANSFI-SA recognised course)
- 8.6 MV2 - Bogies and related maintenance activities (ANSFI-SA recognised course)
- 8.7 MV3 - The pneumatic and brake system and related maintenance activities (ANSFISA-recognised course)
- 8.8 MV4 - The technological system on board and related maintenance activities (ANSFISA recognised course)
- 8.9 MV5 - Traction and repulsion systems and related maintenance activities (ANSFISA recognised course)
- 8.10 MV6 - Electrical circuits and related maintenance activities (ANSFISA accredited course)
- 8.11 MV7 - Doors and related maintenance activities (ANSFI-SA recognised course)
- 8.12 MV8 - The chassis-case and related maintenance activities (ANSFISA accredited course)
- 8.13 MV9 - The fire-fighting system and related maintenance activities (ANSFISA-recognised course)
- 8.14 Air conditioning and toilet technology and maintenance
- 8.15 Maintenance, revamping and end-of-life management of the rolling stock system

## UFC 9 - THE TRAIN SYSTEM: INFRASTRUCTURE AND CONTROL SYSTEMS

- 9.1 Infrastructure technology and maintenance: track and civil works
- 9.2 Infrastructure technology and maintenance: electrical traction
- 9.3 Signalling technology and maintenance: Sistema Controllo Marcia Treno (SCMT), ERTMS, ATO
- 9.4 Security of public transport vehicles from external attacks: security and cybersecurity
- 9.5 Maintenance, revamping and end-of-life management of infrastructure and control systems

## UFC 10 - INTERNSHIP

- 10.1 Company internship

## Timetable and credits for teaching modules

<b>EcoRail23</b>						
Acronym	<b>Higher Technician for the maintenance and sustainable development of railway systems</b>					
Title						
Modules Code	Teaching	Hours UFC	Hours First year	Hours Second year	Credits First year	Credits Second year
	<b>UFC 1 - EMPOWERMENT E TEAM BUILDING</b>	<b>40</b>	<b>First year</b>	<b>Second year</b>	<b>First year</b>	<b>Second year</b>
1.1	Outdoor Training (in ambiente esterno)		8		2	
1.2	Laboratorio di Self Empowerment e Team Building		16			
1.3	Problemsetting and solving - decision making - time management		16			
	<b>UFC 2 - ORIENTATION TOWARDS WORK AND ENTERPRISE</b>	<b>40</b>	<b>First year</b>			
2.1	The enterprise and the employment relationship (contracts)		8		2	
2.2	Company organisation and organisation charts		12			
2.3	Order management techniques		8			
2.4	Supply Chain Management		12		2	
	<b>UFC 3 - LANGUAGE SKILLS</b>	<b>70</b>	<b>First year</b>			
3.1	English Theory		40		3	
3.2	English Laboratory		20		2	
3.3	Technical English		10			
	<b>UFC 4 - QUALITY, SAFETY AND ENVIRONMENT</b>	<b>44</b>	<b>First year</b>			
4.1	Quality policies in the use of processes (ISO 9001)		16		3	
4.2	Safety and accident prevention in the workplace		20			
4.3	Green enterprise; iso 14000 and eco-compatibility of industrial production		8			
	<b>UFC 5 - ADVANCED TECHNOLOGIES FOR RAILWAY MAINTENANCE</b>	<b>240</b>	<b>First year</b>			
5.1	Computer Aided Design		40		2	
5.2	Parametric Solid Modelling		80		4	
5.3	BIM (Building Information Modeling) and link with design		40		3	
5.4	Rapid prototyping and reverse engineering		24		2	
5.5	Virtual, augmented and simulation reality techniques		24		2	
5.6	CBM (Condition Based Monitoring)		16		1	
5.7	Remote measurement for civil works (integrated stations)		16		1	
	<b>UFC 6 - INTRODUCTION TO RAILWAYS (IN ENGLISH)</b>	<b>72</b>	<b>First year</b>			
6.1	Rolling Stock and Safety Bodies		24		5	
6.2	Infrastructure and Safety Organs		24			
6.3	Signalling and safety organs		24			
	<b>UFC 7 - MECHANICAL DESIGN AND VALIDATION</b>	<b>114</b>	<b>First year</b>			
7.1	Mechanical design and ecodesign principles		24		2	
7.2	Numerical analyses and simulations for design validation		22		2	
7.3	Design Documentation		20		1	
7.4	From Design to Product		24		2	
7.5	The validation of railway vehicles		24		1	
	<b>UFC 8 - THE RAIL SYSTEM: VEHICLES</b>	<b>280</b>	<b>First year</b>			
8.1	Types of rail vehicles		24		1	
8.2	Architecture of rail vehicles		20		1	
8.3	Constituent elements of railway vehicles		32		2	
8.4	MV0 - General skills related to the maintenance process (ANSFISA recognised course)		16		1	
8.5	MV1 - Running-in and related maintenance activities (ANSFI-SA recognised course)		16		1	
8.6	MV2 - Bogies and related maintenance activities (ANSFI-SA recognised course)		16		1	
8.7	MV3 - The pneumatic and brake system and related maintenance activities (ANSFISA-recognised course)		16		1	
8.8	MV4 - The technological system on board and related maintenance activities (ANSFISA recognised course)		16		1	
8.9	MV5 - Traction and repulsion systems and related maintenance activities (ANSFISA recognised course)		16		1	
8.10	MV6 - Electrical circuits and related maintenance activities (ANSFISA accredited course)		24		2	
8.11	MV7 - Doors and related maintenance activities (ANSFI-SA recognised course)		16		1	
8.12	MV8 - The chassis-case and related maintenance activities (ANSFISA accredited course)		16		1	
8.13	MV9 - The fire-fighting system and related maintenance activities (ANSFISA-recognised course)		16		1	
8.14	Air conditioning and toilet technology and maintenance		16		1	
8.15	Maintenance, revamping and end-of-life management of the rolling stock system		20		2	
	<b>UFC 9 - THE TRAIN SYSTEM: INFRASTRUCTURE AND CONTROL SYSTEMS</b>	<b>200</b>		<b>Second year</b>		
9.1	Infrastructure technology and maintenance: track and civil works			40		5
9.2	Infrastructure technology and maintenance: electrical traction			40		5
9.3	Signalling technology and maintenance: Sistema Controllo Marcia Treno (SCMT), ERTMS, ATO			40		5
9.4	Security of public transport vehicles from external attacks: security and cybersecu-ri-ty			40		5
9.5	Maintenance, revamping and end-of-life management of infrastructure and control systems			40		5
	<b>UFC 10 - INTERNSHIP</b>	<b>700</b>		<b>Second year</b>		
10.1	Company internship			700		35
	<b>Total hours</b>	<b>1800</b>	<b>900</b>	<b>900</b>	<b>60</b>	<b>60</b>

### ECTS credit system

For each course, ITS PRIME has adopted the credit calculation according to the credit system used in the European Higher Education Area ECTS (European Credit Transfer System). For one-year credits, 60 credits are provided, as for most Higher Education Institutions. Typically 1 credit is equivalent to 25 hours of work between classroom (or laboratory for practical activities) and individual study. For each Didactic Module, the workload required by the students to achieve the expected learning outcomes has been evaluated by evaluation experts and modules teachers. The hours of lessons were considered 30% or 50% of the hours of the workload according to the theoretical or theoretical-practical nature of the different modules. The time spent on the internship in the company and for the laboratory activities was considered 100% of the workload.

### Language of lessons

Italian

### Course calendar

<b>Start-up</b>	<b>September</b>	<b>2023</b>
<b>Preliminary Lessons on fundamental topics to the under-standing of the course</b>	<b>October</b>	<b>2023</b>
<b>End of first year</b>	<b>June</b>	<b>2024</b>
<b>Second-year start</b>	<b>September</b>	<b>2024</b>
<b>Early stage italia</b>	<b>February</b>	<b>2025</b>
<b>Start of foreign internship (if any)</b>	<b>May</b>	<b>2025</b>
<b>End of the course</b>	<b>September</b>	<b>2025</b>
<b>Final examination</b>	<b>October</b>	<b>2025</b>

### Information on the organisation of tutoring and mentoring services

For each course a coordinator and a tutor will be appointed, who will follow and monitor the didactic activities and solve any collective or personal problems of the students.

Accompanying activities to achieve the best learning outcomes will be:



Accompanying activities	Individual hours	Group hours	Total hours
<b>Initials</b>			
Presentation and training agreement		2	2
Individual analysis	2		50
Preliminary Lessons on fundamental topics to the understanding of the course		32	32
<b>Additional training</b>			
English conversation	4		100
Laboratory of production synthesis		48	48
<b>Stage alignment</b>			
Collective orientation internship		4	4
Individual orientation internship	1		25
<b>Accompaniment</b>			
Collective accompaniment		20	20
Individual accompaniment	1		25
<b>Totale</b>	<b>8</b>	<b>106</b>	<b>306</b>

Calculation based on the number of students = 25