

ADVANCED RAIL SYSTEMS SPECIALIST

HIGHER TECHNICIAN IN ADVANCED TECHNOLOGIES FOR RAIL TRANSPORT

<https://www.itsprime.it/corsi-itsprime/advanced-rail-systems-specialist/>

The course is entirely funded by PNRR funds for the enhancement of the training offer of the "ITS Academy" and is therefore **free for participants**.

Course type: Two-year Higher Technical Education course

Teaching location

The course will take place at the ITS PRIME Tech Academy site in **Pistoia, Via Cellini 3B**. Part of the activities may be held at the technological laboratories of universities, companies, and other organizations partnering with the ITS Prime Tech Academy Foundation. Activities may also occasionally take place at facilities of particular educational or scientific interest located elsewhere. Internships (stages) may be carried out at companies located anywhere within the regional, national, and/or European territory.

Enrollment deadline: September 30, 2026.

Final diploma type

Diploma of "Higher Technician for Advanced Mechatronic Design and Production" (Area 6.1 - Process and Product Development and Innovation - Profile 6.1.1 of Annex 1 – Ministerial Decree 203 of 20.10.2023), specifying the course specialization as "HIGHER TECHNICIAN IN ADVANCED TECHNOLOGIES FOR RAIL TRANSPORT," certifying competencies corresponding to Level V of the European Qualifications Framework for lifelong learning (EQF), and constituting a qualification for access to public competitive examinations pursuant to Art. 5, paragraph 7, of the D.P.C.M. of January 25, 2008.

Admission requirements:

Possession of a **Secondary School Diploma or a four-year Vocational Education and Training (leFP) pathway supplemented by a one-year Higher Technical Education and Training (IFTS) pathway**;

Age between **18 and 35** (not yet reached by the application deadline);

Basic knowledge of the English language and computer skills.

Female candidates and/or candidates belonging to disadvantaged categories who are found suitable during the selection process will be automatically admitted to the course as students, up to the reserved quota assigned to them (50% of places for women, 7% for disadvantaged



categories in accordance with Law 68/1999). Admission requirements will be verified during the selection process.

Admission type: Classes may be formed with a **minimum of 20 students**, as required by current national regulations, and a **maximum of 25 students**.

Selection process

The selection process involves:

- curricular evaluation based on qualifications and prior experience: a) Secondary School Diploma b) Any third-party certifications (such as ECDL or Cambridge ESOL, PET, and FCE certificates);
- a written test with multiple-choice questions aimed at assessing: a) General and basic knowledge of the subject area to which the ITS course relates; b) Knowledge of the English language;
- a motivational interview to assess: a) Candidates' motivations, aptitudes, and technical knowledge.

Method of enrollment:

please refer to the link: <https://www.itsprime.it/corsi-itsprime/advanced-rail-systems-specialist/>

Recognition of previous training pathways

Any requests for recognition of training credits must be submitted in writing, together with appropriate documentation, by the course start date at the latest. A committee will evaluate the knowledge and skills acquired in other formal and informal contexts and, if the outcome is positive, will award credits in terms of training hours. This will allow the student to be exempted from attending the relevant UFCs (Capitalizable Training Units).

Course objectives

The “ADVANCED RAIL SYSTEM SPECIALIST” course trains mechatronics technicians with a specialisation in the railway sector. The programme prepares students to understand rolling stock and infrastructure, contribute to design and validation, support advanced maintenance activities, and work with a focus on compliance, functional safety and cybersecurity.

Main job opportunities

Railway systems technician,
Validation technician,
Railway maintenance technician,
Asset management and obsolescence management technician,
Compliance and type-approval support technician,
Diagnostics and condition monitoring technician,
Signalling systems support technician.



Didactic plan

The course will begin by November 2026 and end by August 2028. The actual start date of the course will be announced on the ITS PRIME Tech Academy Foundation website (www.itsprime.it). The training pathway will be structured into 4 semesters for a total of **1,800 hours**:

- **Classroom lessons and laboratory activities: 1,040 hours**
- **Internships, in Italy and abroad: 760 hours**

Most of the subject areas will be delivered in technological laboratories specifically equipped with state-of-the-art technology. Part of the internship may be carried out, on a voluntary basis, at foreign companies, subject to obtaining specific scholarships under the Erasmus+ program. Access to the program will be through participation in a dedicated call, which must be successfully passed as a prerequisite for participation.

Class schedule: Monday to Friday, with a weekly commitment of 35-40 hours. Teaching activities will be suspended for holidays and summer/winter breaks. The entire training program is developed in close coordination with companies in the sector. Over 70% of the teaching staff will be composed of experts from the production, professional, and labor sectors with specific professional experience in the field, giving particular value to staff from companies that are members of the ITS PRIME Tech Academy Foundation. Teachers from universities, research centers, vocational training institutions, and schools will also be involved. The pathway will be complemented by seminar activities, testimonials from industry professionals, and visits to trade fairs, events, companies, and installations of particular interest. Throughout the course, learning assessments are scheduled to verify the actual achievement of the training objectives.

Access to further studies

The diploma may be combined with a subsequent university pathway, with recognition of university training credits (CFU) based on the academic regulations of individual universities. Current legislation should be consulted in this regard.

Attendance benefits

Participants residing more than 50 km from the course location will be granted a contribution toward reimbursement of expenses incurred for meals and accommodation. The contribution will be paid only if the participant successfully completes the ITS training pathway in which they are enrolled. The ITS PRIME Tech Academy Foundation has also arranged for the awarding of Scholarships. The methods and criteria for allocating reimbursements and Scholarships will be defined and communicated to attending students through specific notices and regulations. It is possible to submit a request for a contribution or a Scholarship; however, the award is neither automatic nor guaranteed, but will be evaluated on a case-by-case basis according to the criteria established by current regulations.



Regulations for exams and other assessment methods

Each ITS PRIME Tech Academy course is two years long and consists of Capitalizable Training Units (UFC), each of which is divided into Teaching Modules. At the end of each teaching module, an assessment is scheduled, evaluated on a scale of 100. For modules with a high number of teaching hours, an interim assessment may also be scheduled. Students who have attended at least 80% of the total teaching hours and have obtained a positive evaluation in all teaching modules are admitted to take the final ministerial exam, consisting of technical-practical tests and an interview.

Course structure ***Training Units and Teaching Modules***

UFC 1 - EMPOWERMENT AND TEAM BUILDING

- 1.1 Outdoor Training (outdoor environment)
- 1.2 Self Empowerment and Team Building Workshop
- 1.3 Problemsetting and solving - decision making - time management

UFC 2 - WORK AND BUSINESS ORIENTATION

- 2.1 The company and the employment relationship (contracts)
- 2.2 Business organization and organizational charts
- 2.3 Supply Chain Management

UFC 3 - THINKING INNOVATION: PHILOSOPHY AND DESIGN THINKING

- 3.1 Philosophical foundations of Design Thinking
- 3.2 Philosophy Workshop: The Agoras
- 3.3 Design thinking and critical thinking
- 3.4 The value of innovation: practical workshops

UFC 4 - LANGUAGE SKILLS

- 4.1 English theory
- 4.2 English workshop
- 4.3 Technical English

UFC 5 - QUALITY, SAFETY AND ENVIRONMENT

- 5.1 Quality policies in process management (ISO 9001)
- 5.2 Safety and accident prevention in the workplace (high risk) ISO 18000
- 5.3 Total Quality Management

UFC 6 - FUNDAMENTALS OF MECHANICAL TECHNOLOGY

- 6.1 Materials technology
- 6.2 Mechanical technologies
- 6.3 Mechanical measurements: metrology workshop
- 6.4 Mechanics workshop - CNC programming



UFC 7 - FUNDAMENTALS OF CAD AND TECHNICAL DRAWING

- 7.1 Elements of industrial technical drawing
- 7.2 Regulations for industrial technical drawing
- 7.3 2D and 3D CAD workshop
- 7.4 Reverse engineering workshop

UFC 8 - FUNDAMENTALS OF ELECTRONICS AND ELECTRICAL ENGINEERING

- 8.1 Basics of electrical engineering and electromagnetism
- 8.2 Analog and digital electronics
- 8.3 Control and actuation systems: PLC workshop
- 8.4 Electrical measurements
- 8.5 Electrical systems
- 8.6 Electronics workshop

UFC 9 - IT TOOLS AND ARTIFICIAL INTELLIGENCE

- 9.1 Digital tools for the workplace
- 9.2 Fundamentals of artificial intelligence and machine learning
- 9.3 AI applications workshop: LLMs and agents for the railway sector

UFC 10 - THE RAILWAY SECTOR: SYSTEMS, ARCHITECTURES AND REGULATORY FRAMEWORK

- 10.1 Railway vehicles: types and architectures
- 10.2 Vehicle subsystems: running gear, bogies, brakes and pneumatics (formerly MV1+MV2+MV3)
- 10.3 On-board technological system and electrical circuits (formerly MV4+MV6)
- 10.4 Traction components, doors, chassis-body, fire protection (formerly MV5+MV7+MV8+MV9)
- 10.5 Infrastructure technology: tracks, trackwork, electric traction
- 10.6 Digitalization of railway infrastructure: BIM and 3D surveys (laser scanning, photogrammetry, drones)
- 10.7 Signaling technologies (ERTMS, SCMT, metro/tram systems): simulator workshop
- 10.8 Railway regulatory framework: ANSFISA, ERA, TSI and the approval process

UFC 11 - MECHANICAL DESIGN AND RAILWAY VALIDATION

- 11.1 Railway mechanical design and ecodesign principles
- 11.2 Design process, requirements management and product lifecycle management
- 11.3 From design to product: industrialization and quality
- 11.4 Design verification: numerical analysis and simulations
- 11.5 Design validation: testing and approval
- 11.6 Design workshop

UFC 12 - RAM, SAFETY, CYBERSECURITY, OBSOLESCENCE MANAGEMENT

- 12.1 Reliability, Maintainability, Availability (RAM) and Life Cycle Cost (LCC)
- 12.2 Safety principles (CENELEC EN 50126/8/9)
- 12.3 Cybersecurity in the railway sector (NIS2/CRA, IEC 62443, TS 50701)



- 12.4 Obsolescence Management (IEC 62402) (linked to additive manufacturing in UFC
- 12.5 Integrated project work: compliance + cyber on a real subsystem

UFC 13 - ADVANCED MAINTENANCE, ASSET MANAGEMENT AND OBSOLES- CENCE

- 13.1 Railway maintenance strategies: preventive, predictive, CBM
- 13.2 Railway vehicle maintenance: revamping and end of life
- 13.3 Infrastructure maintenance: revamping and end of life
- 13.4 Predictive diagnostics and Condition-Based Monitoring workshop
- 13.5 Project work: digital twin of a railway subsystem
- 13.6 Additive manufacturing workshop for obsolete railway spare parts

UFC 11 - INTERNSHIP

- 14.1 Internship in a company



Timetable and credits for teaching modules

Acronym	Advanced Rail Systems Specialist						
Title	Higher technician for advanced railway transport technologies						
Mod.	Subject	Module hours	UFC hours	First year	Second year	Training Credits First year	Training Credits Second year
F1	UFC 1 - EMPOWERMENT AND TEAM BUILDING		32				
1.1	Outdoor Training (outdoor environment)	8		8			
1.2	Self Empowerment and Team Building Workshop	12		12		2	
1.3	Problemsetting and solving - decision making - time management	12		12			
	UFC 2 - WORK AND BUSINESS ORIENTATION		32				
2.1	The company and the employment relationship (contracts)	8		8		1	
2.2	Business organization and organizational charts	12		12		1	
2.3	Supply Chain Management	12		12		1	
	UFC 3 - THINKING INNOVATION: PHILOSOPHY AND DESIGN THINKING		48				
3.1	Philosophical foundations of Design Thinking	16		16		1	
3.2	Philosophy Workshop: The Agoras	8		8			
3.3	Design thinking and critical thinking	8		8		1	
3.4	The value of innovation: practical workshops	16		16		1	
	UFC 4 - LANGUAGE SKILLS		64				
4.1	English theory	32		32		2	
4.2	English workshop	20		20		1	
4.3	Technical English	12		12		1	
	UFC 5 - QUALITY, SAFETY AND ENVIRONMENT		40				
5.1	Quality policies in process management (ISO 9001)	8		8		1	
5.2	Safety and accident prevention in the workplace (high risk) ISO 18000	16		16		1	
5.3	Total Quality Management	16		16		1	
	UFC 6 - FUNDAMENTALS OF MECHANICAL TECHNOLOGY		80				
6.1	Materials technology	20		20		2	
6.2	Mechanical technologies	20		20		2	
6.3	Mechanical measurements: metrology workshop	16		16		1	
6.4	Mechanics workshop - CNC programming	24		24		1	
	UFC 7 - FUNDAMENTALS OF CAD AND TECHNICAL DRAWING		72				
7.1	Elements of industrial technical drawing	8		8			
7.2	Regulations for industrial technical drawing	8		8		1	
7.3	2D and 3D CAD workshop	36		36		2	
7.4	Reverse engineering workshop	20		20		1	
	UFC 8 - FUNDAMENTALS OF ELECTRONICS AND ELECTRICAL ENGINEERING		112				
8.1	Basics of electrical engineering and electromagnetism	16		16		1	
8.2	Analog and digital electronics	16		16		1	
8.3	Control and actuation systems: PLC workshop	20		20		1	
8.4	Electrical measurements	16		16		1	
8.5	Electrical systems	20		20		2	
8.6	Electronics workshop	24		24		1	
	UFC 9 - IT TOOLS AND ARTIFICIAL INTELLIGENCE		48				
9.1	Digital tools for the workplace	16		16		1	
9.2	Fundamentals of artificial intelligence and machine learning	12		12		1	
9.3	AI applications workshop: LLMs and agents for the railway sector	20		20		1	
	UFC 10 - THE RAILWAY SECTOR: SYSTEMS, ARCHITECTURES AND REGULATORY FRAMEWORK		196				
10.1	Railway vehicles: types and architectures	24		24		2	
10.2	Vehicle subsystems: running gear, bogies, brakes and pneumatics (formerly MV1+MV2+MV3)	32		32		2	
10.3	On-board technological system and electrical circuits (formerly MV4+MV6)	24		24		2	
10.4	Traction components, doors, chassis-body, fire protection (formerly MV5+MV7+MV8+MV9)	24		24		2	
10.5	Infrastructure technology: tracks, trackwork, electric traction	32		32		2	
10.6	Digitalization of railway infrastructure: BIM and 3D surveys (laser scanning, photogrammetry, drones)	20		20		2	
10.7	Signaling technologies (ERTMS, SCMT, metro/tram systems): simulator workshop	28		28		2	
10.8	Railway regulatory framework: ANSFISA, ERA, TSI and the approval process	12		12		1	
	UFC 11 - MECHANICAL DESIGN AND RAILWAY VALIDATION		132				
11.1	Railway mechanical design and ecodesign principles	20		20		2	
11.2	Design process, requirements management and product lifecycle management	24		24		2	
11.3	From design to product: industrialization and quality	20		20		1	
11.4	Design verification: numerical analysis and simulations	20		20		1	
11.5	Design validation: testing and approval	24		24		2	
11.6	Design workshop	24		24		2	
	UFC 12 - RAM, SAFETY, CYBERSECURITY, OBSOLESCENCE MANAGEMENT		76				
12.1	Reliability, Maintainability, Availability (RAM) and Life Cycle Cost (LCC)	16			16		2
12.2	Safety principles (CENELEC EN 50126/8/9)	16			16		2
12.3	Cybersecurity in the railway sector (NIS2/CRA, IEC 62443, TS 50701)	16			16		2
12.4	Obsolescence Management (IEC 62402) (linked to additive manufacturing in UFC 13)	16			16		2
12.5	Integrated project work: compliance + cyber on a real subsystem	12			12		1
	UFC 13 - ADVANCED MAINTENANCE, ASSET MANAGEMENT AND OBSOLESCENCE		108				
13.1	Railway maintenance strategies: preventive, predictive, CBM	16			16		2
13.2	Railway vehicle maintenance: revamping and end of life	16			16		2
13.3	Infrastructure maintenance: revamping and end of life	16			16		2
13.4	Predictive diagnostics and Condition-Based Monitoring workshop	16			16		1
13.5	Project work: digital twin of a railway subsystem	20			20		2
13.6	Additive manufacturing workshop for obsolete railway spare parts	24			24		1
	UFC 11 - INTERNSHIP		760				
14.1	Internship in a company	760			760		41
	TOTAL HOURS		1800	856	944	60	60



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ECTS credit system

For each course, ITS PRIME Tech Academy has adopted the calculation of credits according to the credit system used in the European Higher Education space ECTS (European Credit Transfer System). For the credits of an annuity there are, as for most Higher Education annuities, 60 credits. 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 necessary for students to achieve the intended learning outcomes was assessed by assessment experts and module teachers. Lecture hours were considered 30% or 50% of the total workload hours according to the theoretical or theoretical-practical nature of the different modules. Time spent on company internship and laboratory activities was considered 100% of the workload.

Language of lessons

Italian

