

OPTICAL & ELECTRONIC SYSTEMS SPECIALIST

HIGHER TECHNICIAN FOR THE DEVELOPMENT AND APPLICATION OF ADVANCED OPTICAL-ELECTRONIC AND MEASUREMENT SYSTEMS

<https://www.itsprime.it/corsi-itsprime/optical-electronic-systems-specialist/>

The course is free for participants. It is fully funded by the PR Toscana FSE+ 2021/2027, Priority 4, Activity 4.f.2 # ITS: allocation of resources to ITS training offer projects under DD 14894 of 02/07/2026, for pathways carried out by the ITS Academy Foundations of Tuscany starting in the 2026/2027 academic year, and is part of Giovanisì (www.giovanisi.it), the Tuscany Region project for youth autonomy.

Course type: Two-year Higher Technical Education course

Teaching location: The course will take place at the ITS PRIME Tech Academy site in **Campi Bisenzio (FI), Via delle Officine Galileo 1**. 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 FOR THE DEVELOPMENT AND APPLICATION OF ADVANCED OPTICAL-ELECTRONIC AND MEASUREMENT SYSTEMS**", 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/optical-electronic-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 “OPTICAL & ELECTRONIC SYSTEMS SPECIALIST” course trains technicians to contribute to the development of electro-optical equipment, overseeing the design, construction, assembly, integration, testing and maintenance phases.

The work placement may take place in companies that design and manufacture optical and electronic equipment, measurement systems, sensors, technologies for the aerospace and defence sectors, or solutions for telecommunications and industrial applications.



Main job opportunities

Electro-optical technician.
Opto-mechanical assembly and integration technician.
Testing technician.
Optical laboratory technician.
Electro-optical equipment maintenance technician.
Production 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: 1,016 hours**
- **Internships, in Italy and abroad: 784 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 Scholar-ships. 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 - CAREER AND BUSINESS ORIENTATION

- 2.1 The company and the employment relationship (contracts)
- 2.2 Company organization and organizational charts
- 2.3 Supply Chain Management
- 2.4 Elements of Project Management

UFC 3 - LANGUAGE SKILLS

- 3.1 English theory
- 3.2 English workshop
- 3.3 Technical English

UFC 4 - QUALITY, SAFETY AND ENVIRONMENT

- 4.1 Quality policies in process management (ISO 9001)
- 4.2 Workplace safety and accident prevention (high risk)
- 4.3 Total Quality Management
- 4.4 Regulations on the installation and maintenance of electrical and electronic systems



UFC 5 - THINKING INNOVATION: PHILOSOPHY AND DESIGN THINKING

- 5.1 Philosophical foundations of Design Thinking
- 5.2 Philosophy workshop: The Agoras
- 5.3 Design thinking and critical thinking
- 5.4 The value of innovation: practical workshops

UFC 6 - FUNDAMENTALS OF ELECTRO-OPTICS

- 6.1 Physical quantities and error theory
- 6.2 Basic optical and radiometric quantities
- 6.3 Elements of geometric optics
- 6.4 Functional optical groups
- 6.5 Basics of detectors
- 6.6 Basics of lasers
- 6.7 Elements of mechanical and optical drawing (dimensions, tolerances, etc.)
- 6.8 Electro-optical sensors
- 6.9 Basic electronics workshop
- 6.10 Principles of image representation (FOV; IFOV; pixels relative to the image frame)
- 6.11 Elements of stabilization systems

UFC 7 - OPTICAL AND ELECTRO-OPTICAL INSTRUMENTATION

- 7.1 Off-axis collimator and blackbodies
- 7.2 Interferometers
- 7.3 Autocollimator and theodolite. Auto level (optical bubble level)
- 7.4 Climate chamber for EO equipment - TV camera
- 7.5 Instrumentation for laser measurements. Optical fibers (single Range Simulator)
- 7.6 Clean room
- 7.7 ESD and problems arising on HW
- 7.8 Optical centering machine. Genevoise
- 7.9 Elements of electrical circuit construction (from schematic to PCB)

UFC 8 - MECHANICAL AND OPTICAL DESIGN AND CONSTRUCTION

- 8.1 Design with CAD tools and reverse engineering
- 8.2 Optical finishing (cosmetics)
- 8.3 Mechanical manufacturing methods and machines (turning, milling, EDM, boring...)
- 8.4 Optical manufacturing methods and machines (grinding, polishing, edging, diamond turning, MRF)
- 8.5 Sustainable and digital production cycles
- 8.6 Measurement and testing techniques and tools (CMM, laser interferometry, autocollimation, comparators and visual inspections)
- 8.7 Mechanical treatments: blackening, etc.
- 8.8 Optical treatments AR/hard coating
- 8.9 Processing cycles and base materials for manufacturing Sensor Frames, Aspheric Lenses, Metal Mirrors
- 8.10 Workshop (optical construction)



UFC 9 - ASSEMBLY AND INTEGRATION OF ELECTRO-OPTICAL EQUIPMENT

- 9.1 Cleaning and handling of optics
- 9.2 Basics of opto-mechanical assemblies
- 9.3 Bonding techniques
- 9.4 Integration flows
- 9.5 TVC test

UFC 10 - TESTING AND MAINTENANCE OF ELECTRO-OPTICAL EQUIPMENT

- 10.1 OGSE and EGSE
- 10.2 Laser Safety
- 10.3 Testing and maintenance measurements on thermal imagers
- 10.4 Testing and maintenance measurements on cameras
- 10.5 Testing and maintenance measurements of pointing systems and stabilization residuals

UFC 11 - FUNDAMENTALS OF CYBER AND SECURE TELECOMMUNICATIONS

- 11.1 Basics of electromagnetism and wave physics
- 11.2 Basics of telecommunication systems (transmitters and receivers, communication chain, signal-to-noise ratios)
- 11.3 Radio telecommunications and networks (AM/FM modulation techniques, LAN-WAN-IP switching and routing networks, WIFI-Bluetooth LTE/5G wireless networks)
- 11.4 Optical fiber and radio links
- 11.5 Computer science and programming (Python, Linux operating systems, virtualization and networking)
- 11.6 Measurements, laboratory and tools (laboratory instrumentation, network measurements, practical workshops)
- 11.7 Security, regulations and quality (network security, firewalls, VPN, cybersecurity fundamentals, ITU/ETSI regulations, SLA service quality)
- 11.8 Mobile radio networks - architecture and implementation
- 11.9 TETRA, DMR networks
- 11.10 MCX networks
- 11.11 Preventive, predictive and corrective maintenance of TLC networks

UFC 12 - INTERNSHIP

- 12.1 Company internship



Timetable and credits for teaching modules

Acronym	Optical & Electronic Systems Specialist						
Title	Higher Technician for the development and application of advanced optical-electronic and measurement systems						
Mod.	Course	Module hours	UFC hours	First year	Second year	Training Credits First year	Training Credits Second year
	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 - CAREER AND BUSINESS ORIENTATION		44				
2.1	The company and the employment relationship (contracts)	8		8		1	
2.2	Company organization and organizational charts	12		12			
2.3	Supply Chain Management	12		12		1	
2.4	Elements of Project Management	12		12		1	
	UFC 3 - LANGUAGE SKILLS		64				
3.1	English theory	32		32		1	
3.2	English workshop	20		20		1	
3.3	Technical English	12		12		1	
	UFC 4 - QUALITY, SAFETY AND ENVIRONMENT		40				
4.1	Quality policies in process management (ISO 9001)	8		8		1	
4.2	Workplace safety and accident prevention (high risk)	16		16			
4.3	Total Quality Management	16		16		1	
	UFC 5 - THINKING INNOVATION: PHILOSOPHY AND DESIGN THINKING		48				
5.1	Philosophical foundations of Design Thinking	16		16		1	
5.2	Philosophy workshop: The Agoras	8		8		1	
5.3	Design thinking and critical thinking	8		8		1	
5.4	The value of innovation: practical workshops	16		16		1	
	UFC 6 - FUNDAMENTALS OF ELECTRO-OPTICS		230				
6.1	Physical quantities and error theory	12		12		1	
6.2	Basic optical and radiometric quantities	20		20		1	
6.3	Elements of geometric optics	36		36		1	
6.4	Functional optical groups	20		20		1	
6.5	Basics of detectors	18		18		1	
6.6	Basics of lasers	16		16		1	
6.7	Elements of mechanical and optical drawing (dimensions, tolerances, etc.)	32		32		1	
6.8	Electro-optical sensors	24		24		1	
6.9	Basic electronics workshop	24		24		1	
6.10	Principles of image representation (FOV; iFOV; pixels relative to the image frame)	12		12		1	
6.11	Elements of stabilization systems	16		16		1	
	UFC 7 - OPTICAL AND ELECTRO-OPTICAL INSTRUMENTATION		122				
7.1	Off-axis collimator and blackbodies	16		16		1	
7.2	Interferometers	12		12		1	
7.3	Autocollimator and theodolite. Auto level (optical bubble level)	16		16		1	
7.4	Climate chamber for EO equipment - TV camera	16		16		1	
7.5	Instrumentation for laser measurements. Optical fibers (single Range Simulator)	10		10		1	
7.6	Clean room	12		12		1	
7.7	ESD and problems arising on HW	12		12		1	
7.8	Optical centering machine. Genevoise	12		12		1	
7.9	Elements of electrical circuit construction (from schematic to PCB)	16		16		1	
	UFC 8 - MECHANICAL AND OPTICAL DESIGN AND CONSTRUCTION		134				
8.1	Design with CAD tools and reverse engineering	16		16		1	
8.2	Optical finishing (cosmetics)	16		16		1	
8.3	Mechanical manufacturing methods and machines (turning, milling, EDM, boring...)	16		16		1	
8.4	Optical manufacturing methods and machines (grinding, polishing, edging, diamond turning, MRF)	16		16		1	
8.5	Sustainable and digital production cycles	10		10		1	
8.6	Measurement and testing techniques and tools (CMM, laser interferometry, autocollimation, comparators and visual inspections)	12		12			
8.7	Mechanical treatments: blackening, etc.	8		8		1	
8.8	Optical treatments AR/hard coating	8		8			
8.9	Processing cycles and base materials for manufacturing Sensor Frames, Aspheric Lenses, Metal Mirrors	12		12		1	
8.10	Workshop (optical construction)	20		20		1	2
	UFC 9 - ASSEMBLY AND INTEGRATION OF ELECTRO-OPTICAL EQUIPMENT		72				
9.1	Cleaning and handling of optics	12		12		1	
9.2	Basics of opto-mechanical assemblies	20		20		1	
9.3	Bonding techniques	16		16		1	
9.4	Integration flows	16		16			
9.5	TVC test	8		8		1	
	UFC 10 - TESTING AND MAINTENANCE OF ELECTRO-OPTICAL EQUIPMENT		50				
10.1	OGSE and EGSE	10		10		1	
10.2	Laser Safety	10		10		1	
10.3	Testing and maintenance measurements on thermal imagers	10		10		1	
10.4	Testing and maintenance measurements on cameras	10		10			
10.5	Testing and maintenance measurements of pointing systems and stabilization residuals	10		10		1	
	UFC 11 - FUNDAMENTALS OF CYBER AND SECURE TELECOMMUNICATIONS		180				
11.1	Basics of electromagnetism and wave physics	16		16		1	
11.2	Basics of telecommunication systems (transmitters and receivers, communication chain, signal-to-noise ratios)	16		16		1	
11.3	Radio telecommunications and networks (AM/FM modulation techniques, LAN-WAN-IP switching and routing networks, WiFi-Bluetooth LTE/5G wireless networks)	20		20		1	
11.4	Optical fiber and radio links	8		8			
11.5	Computer science and programming (Python, Linux operating systems, virtualization and networking)	16		16		1	
11.6	Measurements, laboratory and tools (laboratory instrumentation, network measurements, practical workshops)	20		20		1	
11.7	Security, regulations and quality (network security, firewalls, VPN, cybersecurity fundamentals, ITU/ETSI regulations, SLA service quality)	20		20		1	
11.8	Mobile radio networks - architecture and implementation	16		16		1	
11.9	TETRA, DMR networks	16		16		1	
11.10	MCX networks	16		16		1	
11.11	Preventive, predictive and corrective maintenance of TLC networks	16		16		1	
	UFC 12 - INTERNSHIP		784				
12.1	Company internship	784			784		58
	TOTAL HOURS		1800	996	804	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

