

# OPTRONICS24

## HIGHER TECHNICIAN FOR THE PRODUCTION AND INDUSTRIALIZATION OF COMPLEX ELECTRO-OPTICAL SYSTEMS

<https://www.itsprime.it/corsi-itsprime/optronics24/>

The course is fully funded under Mission 4 - Component 1 Investment 1.5 of PNRR - Strengthening the training offer of the "ITS Academy".

**Free for participants.**

The ITS Prime Foundation has also provided for the award of **Scholarships** on the basis of merit and income. The terms and criteria for allocation and disbursement will be defined and communicated to students attending with appropriate notices and regulations.

### **Type of course:**

Two-year course in higher education.

### **Teaching location:**

the course will take place mainly at the ITS PRIME locations in **Campi Bisenzio (FI)**. Some 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 structures of educational or scientific interest located elsewhere. The internships may take place in companies located in any part of the regional, national and/or European territory.

**Registration deadline:** 26th September 2024, 11pm.

### **Type of final Diploma:**

Diploma in " HIGHER TECHNICIAN FOR DESIGN AND ADVANCED MECHATRONIC PRODUCTION" (Ambito 6.1 - Sviluppo e innovazione del processo e del prodotto - Figura 6.1.1 dell'allegato 1 – DM 203 del 20.10.2023) with indication of specialization of the course in "**HIGHER TECHNICIAN FOR THE PRODUCTION AND INDUSTRIALIZATION OF COMPLEX ELECTRO-OPTICAL SYSTEMS**" with the certification of the competences corresponding to the **European Qualifications Framework for lifelong learning (EQF) level 5** and constitutes a qualification for access to public competitions pursuant to Art. 5, paragraph 7, of the D.P.C.M 25 January 2008.

### **Entry requirements:**

possession of secondary school diploma or after the 4-year Diploma of Vocational Educa



tion and Training (VET) integrated by a one-year Higher Technical Education and Training (IFTTS) course;

age between 18 to 35 years old (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:**

classes can be made up of a **minimum number of 20 students** as required by current national regulations on the matter and a **maximum of 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: <https://www.itsprime.it/corsi-itsprime/optronics24/>

**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 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.

**Course Objectives.**

The course for "OPTRONICS24 - Higher technician for the industrialization and production of complex electro-optical systems" trains professionals specialized in the production, assembly, integration and testing of electro-optical systems in the aerospace, defense and



avionics industries. He/she has skills in optics, optomechanics, applied electronics, production technologies and quality control.

### **Main job opportunities**

Assembly and testing technician

Quality control manager

Optical metrology and production specialist

### **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 (1040 hours),

internship, in Italy and abroad (760 hours). Any foreign internships are carried out with the European Erasmus+ programme.

**Lesson time: Monday to Friday with a weekly commitment of 35-40 hours.** Interruptions in teaching activities will be planned for holidays, summer and winter vacations.

The entire training course is carried out in close connection with the mechanic sector companies. The teaching team is composed of at least 70% 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 the final exam. The exam consists of technical-practical tests and an interview.



## **Course structure**

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

#### **UFC 1 - EMPOWERMENT E TEAM BUILDING**

- 1.1 Outdoor Training (in ambiente esterno)
- 1.2 Laboratorio di Self Empowerment e Team Building
- 1.3 Problemsetting and solving - decision making - time management

#### **UFC 2 - ORIENTATION TO WORK AND ENTERPRISE**

- 2.1 The enterprise and the employment relationship (contracts)
- 2.2 Business organization and organization charts
- 2.3 Job 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 (high risk)
- 4.3 Total Quality Management
- 4.4 Regulations in electrical and electronic installation and maintenance
- 4.5 Laser safety

#### **UF 5 - FUNDAMENTALS OF ELECTRO-OPTICS**

- 5.1 Physical quantities and error theory
- 5.2 Basic optical and radiometric quantities
- 5.3 Elements of geometric optics
- 5.4 Functional optical groups
- 5.5 Basics of detectors
- 5.6 Basics of lasers
- 5.7 Elements of mechanical and optical drawing (Dimensions tolerances etc)
- 5.8 Electro-optical sensors
- 5.9 Basic electronics laboratory
- 5.10 Principles of image representation (FOV; IFOV; pixels referred to the image frame)
- 5.11 Elements of stabilization systems



## **UF 6 - ELECTRO-OPTICAL OPTICAL INSTRUMENTATION.**

- 6.1 Off-axis Collimator and Black Bodies
- 6.2 Interferometers
- 6.3 Autocollimator and theodolite. Autolevel (optical bubble)
- 6.4 Climatic chamber for EO apparatus- TV chamber.
- 6.5 Laser miusure instrumentation. Fiber optics (single range simulator)
- 6.6 Clean room
- 6.7 ESD and problems that are generated on HWs.
- 6.8 Optical centering machine. Genevoise
- 6.9 Elements of electrical circuit construction (from schematic to PCB)

## **UF 7 - MECHANICAL AND OPTICAL DESIGN AND CONSTRUCTION**

- 7.1 Design with CAD tools
- 7.2 Design with reverse engineering
- 7.3 Methods and machines of mechanical fabrication (turning, milling, EDM, boring...)
- 7.4 Optical fabrication methods and machines (grinding, polishing, edging, diamond turning, mrf)
- 7.5 Sustainable and digital manufacturing cycles
- 7.6 Measurement and testing techniques and tools (mmc, laser interferometry, autocollimation, comparators and visual inspections)
- 7.7 Mechanical treatments: blackening etc.
- 7.8 Optical ar/hr treatments
- 7.9 Processing cycles and basic materials for making Frames for Sensors, Aspherical Lenses, Metal Mirrors
- 7.10 Lab

## **UF 8 - ASSEMBLY AND INTEGRATION OF ELECTRO-OPTICAL EQUIPMENT**

- 8.1 Cleaning and handling of optics
- 8.2 Concepts of opto-mechanical assemblies
- 8.3 Bonding techniques
- 8.4 Integration flows
- 8.5 TVC testing

## **UF 9 - TESTING AND MAINTENANCE OF ELECTRO-OPTICAL EQUIPMENT**

- 9.1 OGSE and EGSE
- 9.2 Testing and maintenance measurements on thermal imagers



- 9.3 Testing and maintenance measurements on cameras
- 9.4 Laser testing and maintenance measurements
- 9.5 Testing and maintenance measurements on pointing systems and stabilization residuals

## **UFC 10 - INTERNSHIP**

- 10.1 In-company internship



## Timetable and credits for teaching modules

Acronym	<b>OPTRONICS24</b>						
Title	<b>Higher Technician for the production and industrialization of complex Electro-Optical systems</b>						
Modules Code	Teaching	Hours Module	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>First year</b>	
1.1	Outdoor Training (in ambiente esterno)	8		8		2	
1.2	Laboratorio di Self Empowerment e Team Building	16		16			
1.3	Problemsetting and solving - decision making - time management	16		16			
	<b>UFC 2 - ORIENTATION TO WORK AND ENTERPRISE</b>		<b>40</b>		<b>Second year</b>		<b>Second year</b>
2.1	The enterprise and the employment relationship (contracts)	8			8		1
2.2	Business organization and organization charts	12			12		2
2.3	Job order management techniques	8			8		1
2.4	Supply chain management	12			12		2
	<b>UFC 3 - LANGUAGE SKILLS</b>		<b>68</b>	<b>First year</b>		<b>First year</b>	
3.1	English theory	40		40		2	
3.2	English laboratory	20		20		1	
3.3	Technical English	8		8		1	
	<b>UFC 4 - QUALITY, SAFETY AND ENVIRONMENT</b>		<b>80</b>	<b>First year</b>		<b>First year</b>	
4.1	Quality policies in the use of processes (ISO 9001)	16		16		1	
4.2	Safety and accident prevention in the workplace (high risk)	16		16		1	
4.3	Total Quality Management	8		8		1	
4.4	Regulations in electrical and electronic installation and maintenance	24		24		1	
4.5	Laser safety	16		16		1	
	<b>UF 5 - FUNDAMENTALS OF ELECTRO-OPTICS</b>		<b>292</b>	<b>First year</b>		<b>First year</b>	
5.1	Physical quantities and error theory	16		16		1	
5.2	Basic optical and radiometric quantities	36		36		2	
5.3	Elements of geometric optics	20		20		1	
5.4	Functional optical groups	20		20		1	
5.5	Basics of detectors	24		24		2	
5.6	Basics of lasers	24		24		2	
5.7	Elements of mechanical and optical drawing (Dimensions tolerances etc)	40		40		2	
5.8	Electro-optical sensors	40		40		2	
5.9	Basic electronics laboratory	24		24		1	
5.10	Principles of image representation (FOV; IFOV; pixels referred to the image frame)	24		24		2	
5.11	Elements of stabilization systems	24		24		2	
	<b>UF 6 - ELECTRO-OPTICAL OPTICAL INSTRUMENTATION.</b>		<b>156</b>	<b>First year</b>		<b>First year</b>	
6.1	Off-axis Collimator and Black Bodies	20		20		2	
6.2	Interferometers	20		20		2	
6.3	Autocollimator and theodolite. Autolevel (optical bubble)	16		16		1	
6.4	Climatic chamber for EO apparatus- TV chamber.	16		16		1	
6.5	Laser miisure instrumentation. Fiber optics (single range simulator)	20		20		2	
6.6	Clean room	12		12		1	
6.7	ESD and problems that are generated on HWs.	12		12		1	
6.8	Optical centering machine. Genevoise	20		20		1	
6.9	Elements of electrical circuit construction (from schematic to PCB)	20		20		2	
	<b>UF 7 - MECHANICAL AND OPTICAL DESIGN AND CONSTRUCTION</b>		<b>136</b>	<b>First year</b>		<b>First year</b>	
7.1	Design with CAD tools	32		32		2	
7.2	Design with reverse engineering	16		16		1	
7.3	Methods and machines of mechanical fabrication (turning, milling, EDM, boring...)	24		24		2	
7.4	Optical fabrication methods and machines (grinding, polishing, edging, diamond turning, mrf)	24		24		2	
7.5	Sustainable and digital manufacturing cycles	20		20		1	
7.6	Measurement and testing techniques and tools (mmc, laser interferometry, autocollimation, comparators and visual inspections)	20		20		1	
7.7	Mechanical treatments: blackening etc.	8		8		1	
7.8	Optical ar/hr treatments	8		8		1	
7.9	Processing cycles and basic materials for making Frames for Sensors, Aspherical Lenses, Metal Mirrors	16		16		1	
7.10	Lab	16		16		1	
	<b>UF 8 - ASSEMBLY AND INTEGRATION OF ELECTRO-OPTICAL EQUIPMENT</b>		<b>100</b>	<b>First year</b>		<b>First year</b>	
8.1	Cleaning and handling of optics	16		16		1	
8.2	Concepts of opto-mechanical assemblies	28		28		1	
8.3	Bonding techniques	24		24		1	
8.4	Integration flows	24		24		1	
8.5	TVC testing	8		8		1	
	<b>UF 9 - TESTING AND MAINTENANCE OF ELECTRO-OPTICAL EQUIPMENT</b>		<b>128</b>		<b>Second year</b>		<b>Second year</b>
9.1	OGSE and EGSE	30			30		3
9.2	Testing and maintenance measurements on thermal imagers	30			30		3
9.3	Testing and maintenance measurements on cameras	24			24		3
9.4	Laser testing and maintenance measurements	24			24		3
9.5	Testing and maintenance measurements on pointing systems and stabilization residuals	20			20		3
	<b>UFC 10 - INTERNSHIP</b>		<b>760</b>		<b>Second year</b>		<b>Second year</b>
10.1	In-company internship	760			760		39
	<b>TOTAL HOURS</b>		<b>1800</b>	<b>872</b>	<b>928</b>	<b>60</b>	<b>60</b>



### **ECTS credit system**

For each course, ITS PRIME 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

### **Course calendar**

**The course will start by October 30, 2024 and will end by June 2026.** The actual start date of the course will be communicated via the ITS Prime Foundation website ([www.itsprime.it](http://www.itsprime.it)).

