

SMARTEST22

Course for Higher technician for the design and testing of industrial machines and plants

<http://www.itsprime.it/corsi/nuovi-corsi/smartest22/>

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:

Florence

Registration deadline: 14th December 2022

Type of final Diploma:

Diploma in "HIGHER TECHNICIAN FOR DESIGN AND ADVANCED MECHANICAL PRODUCTION " (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 " HIGHER TECHNICIAN FOR THE DESIGN AND TESTING OF INDUSTRIAL MACHINES AND PLANTS", with skills certification corresponding to level V of the European Qualifications Framework - EQF.**

In order to facilitate circulation at national and European level, the certificate shall be supplemented by the EUROPASS certification.

Entry requirements:

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

age between 18 to 30 years (not completed on the call deadline date);

basic skills in English and ICT.

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/smartest22/>

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 evaluation of the Evaluation Commission that assesses the coherence of the previous training courses with the Training Units and the modules of the course that the student will have to attend. On this basis the Commission indicates which modules can be recognized as already learned by the student.

Profile of the course

The "HIGHER TECHNICIAN FOR THE DESIGN AND TESTING OF INDUSTRIAL MACHINES AND PLANTS" specializes in the design of machines and systems and in the industrialization of their production, in compliance with the design standards required, using the main enabling technologies of Enterprise 4.0 .

Main expected learning outcomes

The graduate of INNOVA20 has the competence:

1. to carry out the design development of the mechanical product using methods and techniques for inventive design, integrated and adaptive, based on the business needs of customization of the product and cost containment;
2. to realize the 2D CAD representation and the 3D CAD modeling of the mechanical product to develop technical tables of description of the project, to set up analysis of static type and kinematic and fluid dynamic simulations;
3. to support the simulation of the production process, in order to choose the materials most suitable for the realization of the components and to optimize the topology for the functional prototyping, the additive and/or subtractive production and the reverse engineering;
4. to manage the manufacturing technologies of the components, programming at CAM the machining paths of the part with subtractive technology and developing the code for their execution (CNC) or implementing the procedures for industrial 3D printing (Additive manufacturing);
5. to define maintenance procedures for production technologies to limit downtime;
6. to manage the production and assembly of mechanical components and products, adapting the configuration of specific operating equipment to better perform the required operations;
7. to collaborate in the definition of a plan of continuous improvement on the business processes (LEAN), realizing interventions of constant refinement of the productive cycle in order to optimize the quality of the products (TQM)



Possibility of access to further studies

The diploma can be integrated with a subsequent university course, with recognition of university training credits (CFU) on the basis of the didactic regulations of the individual universities. In this regard, reference should be made to the current legislation.

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 1100 hours of lessons and at least 50% of the 700 hours of internship in the company, and having obtained in all the Didactic modules at least 60/100, are admitted to 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 5th level of the European Qualifications Framework EQF.

Course structure ***Training Units and Didactic Modules***

First year

UFC 1 - EMPOWERMENT AND TEAM BUILDING

- 1.1 Outdoor Training
- 1.2 Self Empowerment and Team Building Workshop
- 1.3 Problemsetting 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 Digitalisation of industrial production (Industry 4.0)

UFC 3 - LANGUAGE SKILLS

- 3.1 English theory
- 3.2 English laboratory
- 3.3 Technical English

UFC 4 - MECHANICAL DESIGN

- 4.1 Basics of mechanical design
- 4.2 Mechanical equipment design
- 4.3 Automatic machines



- 4.4 Mechanical technical drawing standards
- 4.5 Materials technology
- 4.6 Basic Mechanical Measurements Laboratory
- 4.7 Basic mechanical workshop (manual machines)
- 4.8 Advanced mechanical workshop (numerical control machines)

UFC 5 - TOOLS FOR MECHANICAL DESIGN

- 5.1 Computer Aided Design
- 5.2 Parametric Solid Modelling
- 5.3 3D scanning and reverse engineering
- 5.4 Fundamentals of Finite Element Analysis (FEA)

UFC 6 - QUALITY, SAFETY AND ENVIRONMENT

- 6.1 Quality policies in process utilisation (ISO 9001)
- 6.2 Safety and accident prevention in the workplace (high risk)
- 6.3 Green enterprise; iso 14000 and eco-compatibility of industrial production

UFC 7 - PROCESS AND PRODUCT INDUSTRIALISATION

- 7.1 Production processes and costs of company structures
- 7.2 Production technologies and machining
- 7.3 New Machinery Directive (2006/42/EC)
- 7.4 Design for Production
- 7.5 Technical Documentation and Manuals
- 7.6 Product Lifecycle Management (PLM)
- 7.7 Lean Manufacturing (Six Sigma)
- 7.8 Industrial Production Digitisation (Industry 4.0)

UFC 8 - SYSTEM OPERATION AND MAINTENANCE

- 8.1 Installation and maintenance service organisation
- 8.2 Failure mode prediction techniques
- 8.3 Installation and maintenance of mechanical, pneumatic and electrical devices

UFC 9 - INTRODUCTION TO PLANT ENGINEERING

- 9.1 Plant engineering solutions for power generation and energy transition
- 9.2 Basic principles of hydraulics (pressure drops in ducts and pipes, concept of prevalence)
- 9.3 Basic principles of thermodynamics/heat transfer (specific heat, enthalpy; conducting/conveying)

UFC 10 - EXPERIMENTAL VALIDATION OF MACHINES AND PLANT SOLUTIONS FOR THE ENERGY SECTOR

- 10.1 Industrial validation: types of validation and their impacts in terms of costs and resources
- 10.2 Phases of experimental validation: from design to execution, risk abatement approach
- 10.3 Types of measurements possible in machine and component validation



- 10.4 Measurements on Systems under Test: Basic Principles and Possible Criticalities / Effect of Installation Modes on Measurement
- 10.5 Fundamentals of metrology / Calibration of instruments
- 10.6 Mechanical (Pressure, Temperature) and Electrical Measurement Laboratory
- 10.7 Laboratory for Advanced Mechanical Measurements (CT, CMM, Optical Scanning, etc.)

Second year

UFC 1 (2nd year) - DESIGN AND INSTALLATION OF TEST BENCHES

- 11.1 Flow Diagrams and P&IDs of plant fluid systems - Creation process and reading guide
- 11.2 Hints on sizing of pressure systems (thin-walled cylinders, flat and spherical bottoms, flanges)
- 11.3 Pressure Piping ASME B31 - Design, Components, Materials, Fabrication, Assembly, Inspection & Testing
- 11.4 Pressure Vessels & Heat Exchangers Overview - Design Standards, Installation & Maintenance Needs
- 11.5 PED Directive
- 11.6 Actions on Constructions - Overview and Peculiarities
- 11.7 Designing Metal Structures (Beams & Columns, Shear, Bending)
- 11.8 Metal structures for industrial use - Functional principles, execution and installation
- 11.9 Application of ergonomic and safety principles in the design of plant infrastructures
- 11.10 Lifting operations and equipment (cranes not included, to be covered during the stage)
- 11.11 Operational Hazards (HAZID/HAZOP) and HSE (FMEA-based Risk Assessment)
- 11.12 Welding of metal structures and piping
- 11.13 Nondestructive testing of metal structures and piping
- 11.14 Atmospheric corrosion and protective systems: galvanising and painting

UF 2 (2 years) - FUNDAMENTATION OF TECHNOLOGY APPLIED TO MESHING SYSTEMS AND INSTALLATION OF SENSORS

- 12.1 Outlines of resin and cement bonding, micro-welding
- 12.2 Notes on brazing and moulded sensors
- 12.3 Experimental validation in the field: "Experiment Design", "PoC Report" and "Operative Instruction".

UF 3 (2nd year)- ELECTROTECHNICS AND ELECTRONICS BASICS APPLIED TO MEASUREMENT SYSTEMS

- 13.1 Recalls of electrical engineering
- 13.2 Notes on the operation and control of electrical machines
- 13.3 ATEX Directive
- 13.4 Overview of Signal and Error Theory
- 13.5 Measurement Chains and Loop Checks
- 13.6 Characteristics of Data Acquisition Systems and Human Machine Interfaces

UF 4 (2nd year) - INTERNSHIP

- 14.1 Internship in the company



Diagram of the structure of the course with the relative credits

SMARTEST22						
Acronym	Higher technician for the design and testing of industrial machines and plants					
Title	Higher technician for the design and testing of industrial machines and plants					
Modules Code	Teaching	Hours UFC	Hours First year	Hours Second year	Credits First year	Credits Second year
			First year	Second year	First year	Second year
	UFC 1 - EMPOWERMENT E TEAM BUILDING	28	First year	Second year	First year	Second year
1.1	Outdoor Training (in ambiente esterno)		8		2	
1.2	Laboratorio di Self Empowerment e Team Building		8			
1.3	Problemsetting and solving - decision making - time management		12			
	UFC 2 - ORIENTATION TOWARDS WORK AND ENTERPRISE	40	First year			
2.1	The enterprise and the employment relationship (contracts)		8		4	
2.2	Company organisation and organisation charts		12			
2.3	Order management techniques		8			
2.4	Digitalisation of industrial production (Industry 4.0)		12			
	UFC 3 - LANGUAGE SKILLS	68	First year			
3.1	English theory		40		3	
3.2	English laboratory		20		2	
3.3	Technical English		8		1	
	UFC 4 - MECHANICAL DESIGN	268	Primo anno			
4.1	Basics of mechanical design		40		3	
4.2	Mechanical equipment design		40		3	
4.3	Automatic machines		20		1	
4.4	Mechanical technical drawing standards		16		1	
4.5	Materials technology		40		2	
4.6	Basic Mechanical Measurements Laboratory		32		2	
4.7	Basic mechanical workshop (manual machines)		40		1	
4.8	Advanced mechanical workshop (numerical control machines)		40		1	
	UFC 5 - TOOLS FOR MECHANICAL DESIGN	156	First year			
5.1	Computer Aided Design		40		2	
5.2	Parametric Solid Modelling		80		4	
5.3	3D scanning and reverse engineering		20		1	
5.4	Fundamentals of Finite Element Analysis (FEA)		16		1	
	UFC 6 - QUALITY, SAFETY AND ENVIRONMENT	44	First year			
6.1	Quality policies in process utilisation (ISO 9001)		16		1	
6.2	Safety and accident prevention in the workplace (high risk)		20		1	
6.3	Green enterprise; iso 14000 and eco-compatibility of industrial production		8		1	
	UFC 7 - PROCESS AND PRODUCT INDUSTRIALISATION	164	First year			
7.1	Production processes and costs of company structures		32		2	
7.2	Production technologies and machining		20		1	
7.3	New Machinery Directive (2006/42/EC)		12		1	
7.4	Design for Production		20		1	
7.5	Technical Documentation and Manuals		20		1	
7.6	Product Lifecycle Management (PLM)		20		1	
7.7	Lean Manufacturing (Six Sigma)		32		2	
7.8	Industrial Production Digitisation (Industry 4.0)		8		1	
	UFC 8 - SYSTEM OPERATION AND MAINTENANCE	44	First year			
8.1	Installation and maintenance service organisation		12		1	
8.2	Failure mode prediction techniques		8		1	
8.3	Installation and maintenance of mechanical, pneumatic and electrical devices		24		2	
	UFC 9 - INTRODUCTION TO PLANT ENGINEERING	40	First year			
9.1	Plant engineering solutions for power generation and energy transition		8		4	
9.2	Basic principles of hydraulics (pressure drops in ducts and pipes, concept of prevalence)		16			
9.3	Basic principles of thermodynamics/heat transfer (specific heat, enthalpy; conducting/conveying)		16			
	UFC 10 - EXPERIMENTAL VALIDATION OF MACHINES AND PLANT SOLUTIONS FOR THE ENERGY SECTOR	48	First year			
10.1	Industrial validation: types of validation and their impacts in terms of costs and resources		2		2	
10.2	Phases of experimental validation: from design to execution, risk abatement approach		2			
10.3	Types of measurements possible in machine and component validation		4			
10.4	Measurements on Systems under Test: Basic Principles and Possible Criticalities / Effect of Installation Modes on Measurement		4			
10.5	Fundamentals of metrology / Calibration of instruments		12		1	
10.6	Mechanical (Pressure, Temperature) and Electrical Measurement Laboratory		12		1	
10.7	Laboratory for Advanced Mechanical Measurements (CT, CMM, Optical Scanning, etc.)		12		1	

	UFC 1 (2nd year) - DESIGN AND INSTALLATION OF TEST BENCHES	116		Second year	
11.1	Flow Diagrams and P&IDs of plant fluid systems - Creation process and reading guide			16	1
11.2	Hints on sizing of pressure systems (thin-walled cylinders, flat and spherical bott			8	1
11.3	Pressure Piping ASME B31 - Design, Components, Materials, Fabrication, Assem-bly, Inspection & Testing			16	1
11.4	Pressure Vessels & Heat Exchangers Overview - Design Standards, Installation & Maintenance Needs			4	1
11.5	PED Directive			8	1
11.6	Actions on Constructions - Overview and Peculiarities			4	1
11.7	Designing Metal Structures (Beams & Columns, Shear, Bending)			12	1
11.8	Metal structures for industrial use - Functional principles, execution and installation			4	1
11.9	Application of ergonomic and safety principles in the design of plant infrastructures			4	1
11.10	Lifting operations and equipment (cranes not included, to be covered during the stage)			4	1
11.11	Operational Hazards (HAZID/HAZOP) and HSE (FMEA-based Risk Assessment)			12	1
11.12	Welding of metal structures and piping			8	1
11.13	Nondestructive testing of metal structures and piping			8	1
11.14	Atmospheric corrosion and protective systems: galvanising and painting			8	1
	UF 2 (2 years) - FUNDAMENTATION OF TECHNOLOGY APPLIED TO MESHING SYSTEMS AND INSTALLATION OF SENSORS	20		Second year	
12.1	Outlines of resin and cement bonding, micro-welding			12	2
12.2	Notes on brazing and moulded sensors			4	
12.3	Experimental validation in the field: "Experiment Design", "PoC Report" and "Ope-rative Instruction".			4	
	UF 3 (2nd year)- ELECTROTECHNICS AND ELECTRONICS BASICS APPLIED TO MEASUREMENT SYSTEMS	64		Second year	
13.1	Recalls of electrical engineering			12	2
13.2	otes on the operation and control of electrical machines			12	2
13.3	ATEX Directive			8	1
13.4	Overview of Signal and Error Theory			16	2
13.5	Measurement Chains and Loop Checks			8	1
13.6	Characteristics of Data Acquisition Systems and Human Machine Interfaces			8	1
	UF 4 (2 anno) - INTERNSHIP	700		Second year	
14.1	Internship in the company			700	35
	TOTALE ORE	1800	900	900	60

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.

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.



Language of lessons

Italian

Course calendar

Start-up	December	2022
Preliminary Lessons on fundamental topics to the understanding of the course	December	2022
End of first year	June	2023
Second-year start	September	2023
Start of internship in Italy	February	2024
Start of foreign internship (if any)	May	2024
End of the course	September	2024
Final examination	October	2024

Information on the organisation of mentoring and accompanying 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
Initials			
Presentation and training agreement		2	2
Individual analysis	2		50
Preliminary Lessons on fundamental topics to the understanding of the course		32	32
Additional training			
English conversation	4		100
Laboratory of production synthesis		48	48
Stage alignment			
Collective orientation internship		4	4
Individual orientation internship	1		25
Accompaniment			
Collective accompaniment		20	20
Individual accompaniment	1		25
Totale	8	106	306

Calculation based on the number of students = 25

