# ManuMec23

**Course for Higher Technician for Maintenance Management of industrial machines and plants**

http://www.itsprime.it/corsi/nuovi-corsi/manumec23-firenze/

**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 (IFTS) course.

**Teaching location:**
the course will take place mainly at **the headquarters of the ITS PRIME Foundation, Via Panciatichi, 29 – Florence and** in the classrooms located inside **the Baker Hughes Nuovo Pignone factory in via Felice Matteucci, 2 Florence**. 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 20, 2023

**Type of final Diploma:**
Diploma in " HIGHER TECHNICIAN FOR THE INNOVATION OF MECHANICAL PROCESSES AND PRODUCTS " (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 MAINTENANCE MANAGEMENT OF INDUSTRIAL MACHINES AND PLANTS" 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 (IFTS) 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/manumec23-firenze/

**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 MAINTENANCE MANAGEMENT OF INDUSTRIAL MACHINES AND PLANTS” is specialised in defining and applying maintenance techniques for machinery, equipment and plants to ensure maximum efficiency of production systems in the manufacturing industry.

**Main expected learning outcomes**
The **ManuMec23** graduate has the competence to:

- establish maintenance procedures for industrial machines and plants and manage intervention times in order to minimise them;
- implement methods for the control of faults and to avoid blocking the functions of the companies' production system;
  identify and implement strategies for planned maintenance interventions that reduce downtime;

- define remote maintenance intervention procedures to reduce the travel costs of maintenance personnel;
- apply predictive maintenance techniques in order to prevent breakdowns or to minimise their severity;
- use application software for the organisation and management of maintenance services, based on the functional needs of the company structure, also using production data (Big Data)
- know and apply maintenance procedures for machines and plants, carried out guaranteeing safety and accident prevention;
- know and apply the testing techniques for certifying the restoration of the functionality of machines and plants, after maintenance work has been carried out;
- know the regulations and economic bases for managing contracts in industrial maintenance services;
- managing and carrying out maintenance work on water and fire-fighting, thermal and air-conditioning, electrical and special systems;
- manage and carry out maintenance work on all industrial production machines and plants
- managing and carrying out maintenance work on turbomachinery (centrifugal compressors, gas and steam turbines, turbopumps, etc.).

**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 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 TOWARDS WORK AND ENTERPRISE
2.1 The enterprise and the employment relationship (contracts)
2.2 Company organisation and organisation charts
2.3 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 Green enterprise; iso 14000, sustainability and eco-compatibility of in-dustrial production

UFC 5 - MECHANICAL TECHNOLOGIES
5.1 Materials technology
5.2 Mechanical technology
5.3 Mechanical measurement laboratory
5.4 Mechanical laboratory

UFC 6 - ELECTRONICS AND ELECTRICAL ENGINEERING
6.1 Basics of electrical engineering and electromagnetism
6.2 Analogue and digital electronics
6.4 Electrical measurements
6.5 Electrical installations
6.6 Digitisation of industrial production (Industry 4.0)
6.7 Electronics workshop

UFC 7 - CAD AND TECHNICAL DRAWING

7.1 Elements of industrial technical drawing
7.2 Industrial technical drawing standards
7.3 Machine and Plant Design
7.4 Computer Aided Design (AutoCAD

UFC 8 - ORGANISATION AND MANAGEMENT OF THE MAINTENANCE SERVICE

8.1 Technical/administrative management and control documentation
8.2 Teleservice
8.3 EAM maintenance management software
8.4 Elements of Project Management
8.5 Environmental regulations for correct plant operation
8.6 Elements of waste management
8.7 Principles of procurement management legislation

UFC 9 - PREVENTIVE AND PREDICTIVE MAINTENANCE MANAGEMENT

9.1 Maintenance types and strategies
9.2 Types of failures and/or breakdowns
9.3 Elements of reliability theory
9.4 Failure mode prediction techniques
9.5 Testing techniques

UFC 10 - MAINTENANCE OF SERVICE TECHNOLOGY INSTALLATIONS

10.1 Types, components, maintenance and safety of water and fire protection systems
10.2 Types, components, maintenance and safety of heating and air-conditioning installations
10.3 Types, components, maintenance and safety of electrical installations
10.4 Types, components, maintenance and safety of special installations

UFC 11 - MAINTENANCE OF MACHINES FOR INDUSTRIAL PRODUCTION

11.1 Types of machines
11.2 Types, components, maintenance and safety of production machines
11.3 Practical exercises on machines

UFC 12 - TURBOMACHINERY MAINTENANCE

12.1 The power industry
12.2 Production and maintenance of centrifugal compressors
12.3 Production and maintenance of gas and steam turbines
12.4 Production and maintenance of turbopumps
12.5 Cogeneration and trigeneration plants

UFC 13 - INTERNSHIP

13.1 Company internship

ITS PRIME Tech Academy

# Timetable and credits for teaching modules

| Acronym | ManuMec23 | | | | | |
|---|---|---|---|---|---|---|
| Title | Higher Technician for Maintenance Management of industrial machines and plants | | | | | |
| Modules Code | Teaching | Hours UFC | Hours First year | HoursSecond year | Credits First year | Credits Second year |
| | **UFC 1 - EMPOWERMENT E TEAM BUILDING** | **40** | **First year** | | **First year** | **Second year** |
| 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 | | | |
| | **UFC 2 - ORIENTATION TOWARDS WORK AND ENTERPRISE** | **32** | | **Second year** | | |
| 2.1 | The enterprise and the employment relationship (contracts) | | | 8 | | 4 |
| 2.2 | Company organisation and organisation charts | | | 12 | | |
| 2.3 | Supply chain management | | | 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 | | | |
| | **UFC 4 - QUALITY, SAFETY AND ENVIRONMENT** | **52** | **First year** | | | |
| 4.1 | Quality policies in the use of processes (ISO 9001) | | 16 | | 1 | |
| 4.2 | Safety and accident prevention in the workplace (high risk) | | 20 | | 2 | |
| 4.3 | Green enterprise; iso 14000, sustainability and eco-compatibility of in-dustrial production | | 16 | | 1 | |
| | **UFC 5 - MECHANICAL TECHNOLOGIES** | **120** | **First year** | | | |
| 5.1 | Materials technology | | 24 | | 2 | |
| 5.2 | Mechanical technology | | 32 | | 2 | |
| 5.3 | Mechanical measurement laboratory | | 24 | | 2 | |
| 5.4 | Mechanical laboratory | | 40 | | 2 | |
| | **UFC 6 - ELECTRONICS AND ELECTRICAL ENGINEERING** | **128** | **First year** | | | |
| 6.1 | Basics of electrical engineering and electromagnetism | | 16 | | 1 | |
| 6.2 | Analogue and digital electronics | | 16 | | 1 | |
| 6.4 | Electrical measurements | | 20 | | 2 | |
| 6.5 | Electrical installations | | 28 | | 2 | |
| 6.6 | Digitisation of industrial production (Industry 4.0) | | 8 | | | |
| 6.7 | Electronics workshop | | 40 | | 2 | |
| | **UFC 7 - CAD AND TECHNICAL DRAWING** | **120** | **First year** | | | |
| 7.1 | Elements of industrial technical drawing | | 32 | | 2 | |
| 7.2 | Industrial technical drawing standards | | 28 | | 2 | |
| 7.3 | Machine and Plant Design | | 20 | | 1 | |
| 7.4 | Computer Aided Design (AutoCAD | | 40 | | 3 | |
| | **UFC 8 - ORGANISATION AND MANAGEMENT OF THE MAINTENANCE SERVICE** | **88** | **First year** | | | |
| **8.1** | Technical/administrative management and control documentation | | 28 | | 3 | |
| 8.2 | Teleservice | | 16 | | 2 | |
| 8.3 | EAM maintenance management software | | 8 | | | |
| 8.4 | Elements of Project Management | | 12 | | 3 | |
| 8.5 | Environmental regulations for correct plant operation | | 8 | | | |
| 8.6 | Elements of waste management | | 8 | | | |
| 8.7 | Principles of procurement management legislation | | 8 | | | |
| | **UFC 9 - PREVENTIVE AND PREDICTIVE MAINTENANCE MANAGEMENT** | **40** | **First year** | | | |
| 9.1 | Maintenance types and strategies | | 8 | | 4 | |
| 9.2 | Types of failures and/or breakdowns | | 8 | | | |
| 9.3 | Elements of reliability theory | | 8 | | | |
| 9.4 | Failure mode prediction techniques | | 8 | | | |
| 9.5 | Testing techniques | | 8 | | | |
| | **UFC 10 - MAINTENANCE OF SERVICE TECHNOLOGY INSTALLATIONS** | **132** | **First year** | | | |
| 10.1 | Types, components, maintenance and safety of water and fire protection systems | | 24 | | 2 | |
| 10.2 | Types, components, maintenance and safety of heating and air-conditioning installations | | 40 | | 4 | |
| 10.3 | Types, components, maintenance and safety of electrical installations | | 40 | | 4 | |
| 10.4 | Types, components, maintenance and safety of special installations | | 28 | | 3 | |
| | **UFC 11 - MAINTENANCE OF MACHINES FOR INDUSTRIAL PRODUCTION** | **124** | | **Second year** | | |
| 11.1 | Types of machines | | | 24 | | 3 |
| 11.2 | Types, components, maintenance and safety of production machines | | | 60 | | 5 |
| 11.3 | Practical exercises on machines | | | 40 | | 2 |
| | **UFC 12 - TURBOMACHINERY MAINTENANCE** | **156** | | **Second year** | | |
| 12.1 | The power industry | | | 40 | | 4 |
| 12.2 | Production and maintenance of centrifugal compressors | | | 20 | | 3 |
| 12.3 | Production and maintenance of gas and steam turbines | | | 60 | | 5 |
| 12.4 | Production and maintenance of turbopumps | | | 20 | | 2 |
| 12.5 | Cogeneration and trigeneration plants | | | 16 | | 2 |
| | **UFC 13 - INTERNSHIP** | **700** | | **Second year** | | |
| 13.1 | Company internship | | | 700 | | 30 |
| | **TOTAL HOURS** | **1800** | **788** | **1012** | **60** | **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.

**Language of lessons**

Italian

**Course calendar**

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

**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 |
|---|---|---|---|
| **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