



Proposal for the Design of the Foundation Curriculum, prepared within
the European programme framework of the H2 Training Project:

Higher Vocational Training Programme in Energy Efficiency and
Hydrogen Technology

Education and Culture

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Pilot Projects

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Higher Vocational Training in Energy Efficiency and Hydrogen Technology

CHAPTER I.- GENERAL PROVISIONS

In order to understand this document it is necessary to consider the prescriptive aspects shaped in the different Real Decrees and Orders which regulate them within the independent Community of Aragon. Therefore the devising of the curricular profile design has been undertaken following the regulations approved in the Government report of Aragon, number 73, date 04/06/08, where it published the:

Order from 29th of May 2008, of the Education, Culture and Sport Council, by which is established the basic vocational training structure and its implementation in the Independent Community of Aragon.

As it appears:

Article 1.- Purpose and nature of application.

1. The current Order establish the basic structure which should follow the Vocational Training curriculum for the development of Further Education training, as it is implemented in the Royal Decree 1538/2006, 15th of December, which establish the general organization of Further Education training.

2. The nature of application is the Further Education training and its implementation in the educational centres of the Independent Community of Aragon.

Article 2.- Teaching objectives of Vocational Training in Aragon.

The aim of independent curriculum vocational training is that all citizens who follow this training in Aragon achieve capacities and competences which allow them to:

- a) Develop the general competence equivalent to professional qualification or qualifications included in its equivalent further education award.
- b) Understand the organization and characteristics of a specific productive sector, as well as the professional mechanisms involved; to be familiar with the basic working legislation, rights and duties from a working relationship.
- c) Achieve knowledge and the necessary abilities to work in healthy and safe conditions, as well as to avoid possible risks from the working environment.
- d) Learn independently and work in teams, as well as training in the prevention of conflicts and its peaceful resolution in all environments; personal, work and social.
- e) Achieve a motivating personal and professional identity and maturity in future learning and adjustment to the development of productive process and social change.

CHAPTER II.- BASIC STRUCTURE OF THE CURRICULUM

Organization by vocational training

1. Further Education teaching, in agreement with the national organization, is organized in intermediate and higher vocational cycles and in order to comply with the content of the curriculum the following should be considered:

- a) Intermediate vocational cycle should prepare to allow the professional competences in order to participate in specific activities which are sufficiently specific for executive and organizational jobs and can be independent within the limit of use of instruments and own techniques.
- b) Higher vocational training prepare in professional skills and focus on the execution of activities linked to technical jobs which can be carried out independently and by sharing responsibilities in organization and coordination of staff.

Parts of the curriculum in vocational training

1. The vocational training curriculum will be established in agreement with the demands stipulated by the Further Education National Qualifications Framework Standards, and particularly from its application in Aragon, supporting long life learning.

2. By Further Vocational Education curriculum, it is understood that a group of professional, personal and social competences, aims, learning outcomes and assessment criteria, content and teaching guidelines must be regulated by the teaching Institution. In any case it should include the basic content of basic teaching of its equivalent award.

3. The vocational training curriculum will be organized in professional modules, in which learners will be able to achieve the necessary professional, social and personal skills in order to develop a profession in regulation to the general vocational training competence.

4. In the curriculum of the vocational training there will be included, either in transversal or specific form, training suitable to information and communication technology, team work, work risk prevention and development of enterprising, innovation and research.

5. It will also include in specific form, transversal form or by which procedure which may be appropriate to the training equivalent to the languages spoken in the European Union.

6. The vocational training curriculum will be underpinned in the education institutions in agreement with educational programs of the professional modules.

Vocational Curriculum development training

This document constitutes the Outline of the Curriculum Foundation Design (PDCB) of the professional title of *Senior Technician in Energy and Hydrogen Technology Efficiency* for the Independent Community of Aragon. It contains general objectives, modules which form the structure (skills, content and assessment criteria), appropriate socioproductive references and the different guidelines, directions and assessments for the organization and implementation of this training.

a) Identification of the title:

The title of Senior Technician in Energy Efficiency and Hydrogen Technology is recognized by the following parts:

Designation/Feature: **Energy Efficiency and Hydrogen Technology.**

Level: **Higher Vocational Training .**

Duration: **2000 hours.**

Professional membership: **Energy and Water**

European Reference: CINE-5B (International Education Grading Standard Regulation).

b) Professional Title Profile

The profile of the professional title Senior Technician in Energy Efficiency and Hydrogen Technology is determined by its general competence, the professional, personal and social skills, and by the equivalence of qualifications in the National Catalogue of Professional Qualifications included in the award.

c) General Competences/Jurisdiction

The general competencies of this award consist of evaluation of the hydrogen efficiency, supporting technically the process of qualification and energy accreditation/certification of the Hydrogen processing plants, quality control in shape, and handling assemble and maintenance of hydrogen plants and compliant with the existing safety regulations.

d) Professional, personal and social competencies.

Professional, personal and social competencies of this award are as follows:

- a) Assess energy performance of hydrogen plants following the required regulations to evaluate energy efficiency.
- b) Prepare proposals for the improvement of efficiency in thermal plants, with built –in energy saving systems.
- c) Prepare proposals for the improvement of efficiency in lighting plants assessing team performance and level of natural light use.
- d) Check that building surroundings follow the legal requirements of limit in energy demand, analyzing the characteristics of the enclosure.

- e) Apply the established procedures and recognized computerized programs for accreditation and certification of buildings procedure.
- f) Prepare reports on buildings thermal behaviour as well as characteristics of its surroundings and its thermal plants.
- g) Manage administrative issues and documentation linked to inspection and energy accreditation/certification.
- h) Assess energy and hot water usage and consumption in buildings, proposing saving and efficient usage alternatives.
- i) Formalize solar plant proposals in response to client's energy demands.
- j) Structure of thermal solar plants defining the characteristics of its components.
- k) Prepare reports, technical memos, plans, proposals and thermal solar plants project budgets in compliance with the current legislation.
- l) Assembling and maintenance management of thermal solar plants, work plans and supply development and assessment of quality control.
- m) Organize and supervise hydrogen plants assembling and maintenance of health and safety control and ensure it is carried out.
- n) Manage administrative issues and documentation linked to the procedure of structuring, assembling and maintenance of hydrogen plants.
- o) Promotion of products, marketing and services linked to the efficient use of energy and hydrogen technology.
- p) Participate in the organization, development and assessment of dissemination plans to consumers, organizations and professionals in the efficient usage of energy and hydrogen technology.
- q) Establish efficient means of professional and communicative relationships with their management, colleagues and subordinates, respecting the independence and competences of different people.
- r) Lead community issues which could emerge, intervening in personal and work related conflicts, and contribute towards a pleasant working environment, behaving at all times in a respectful and tolerant manner.
- s) Manage professional development, assessing employment opportunities, self employment and training.
- t) Maintain an innovative and update spirit in the field of its work, in order to adapt to technological and organizational changes in its professional environment.
- u) To form and manage a small company, doing a viability study of the products, production planning and marketing.

- v) Participate in an active way in the financial, social, and cultural life, with a critical and responsible attitude.

e) Equivalence of qualification and standards of the National Professional Qualifications Catalogue included in the award.

Complete professional qualifications:

- a) Buildings energy efficiency ENA358_3 (R.D. 1698/2007, 14th of December), which includes the following units of competence:

UC1194_3: Evaluate Efficiency energy in building plants.

UC1195_3: Collaborate in the accreditation/certification procedure in the energy of buildings.

UC1196_3: Manage the efficient use of sanitation hot water in building.

UC0842_3: Assess project viability of solar plants.

UC1197_3: Promote efficient use of energy.

f) Professional environment

1. This professional exercises its practice in the energy sector, in companies and specialized organizations in auditing, inspections and energy accreditation, as well as in companies aimed to do viability, promotion, implementation and maintenance of solar power in buildings.

2. The most relevant occupations and work positions are:

Technician in building energy efficiency.

Assistant in power certification/accreditation procedure in buildings.

Commercial Technician in solar power plants.

Designer in thermal solar plants.

Those responsible for assembling the thermal solar plants.

Those responsible for maintenance of the thermal solar plants.

Energy Manager.

Energy efficiency programs developer/champion.

g) Award Prospective in the sector or sectors

The Education Authorities in the developing of this curriculum will take into account the following considerations:

- a) The aim of the European Union, within its energy policy, is to reduce substantially the consumption of energy without placing a burden on the present well-being and development standard. Therefore, this sector aims towards the implementation of regulated frameworks that encourage saving and efficiency, innovation and improvement of technology procedures, the use of better and more efficient energy equipment, the reduction of thermal losses, use of renewal energy and towards the adoption of policies of sensitization of the citizens and the training in field of vocational training specialists. These constitute some of the main parts of the European Community Commission “Action plan for energy efficiency”. This plan contemplates a

set of high-priority actions for the next few years. Among others, and within the framework of this award stand out the following three:

- Labelling of machinery and equipment and minimum energy efficiency regulations.
- Implementation of efficiency requirements for the building of low power energy consumption.
- Sensitizing in respect to power energy efficiency.

Regarding sensitized action, this efficiency plan points out that in the field of education, some priority areas will be: the drawing up of plans and education and training programs for the staff responsible for the energy management in private and state companies. Other examples will be teaching assistance for primary and secondary and vocational training education, which will be developed through community programs and recommendations to the member States, as well as via cooperation with educational entities at the level of Member States and the Community.

- b) The “Spanish Strategy of Climate Change and Clean Power Energy Horizon 2007-2012-2020”, carries out the responsibility which Spain has in issues of climate change and the encouragement of clean power energy. It dedicates a specific chapter to “clean energy” which comprises of the renewal and energy power efficiency, setting up objectives and ambitious measurements for each field and taking as an aim to achieve from the year 2010 renewable power energies to be placed in a strategic and competitive position against fossil fuel, increasing its contribution in the Spanish energy power market until it achieves a contribution of raw electricity consumption of 32% in 2012 and 37% in 2020.

The development of the above mentioned strategy in the national context continues to develop, in the Independent Communities, initiative elections which are allowing the development of coherent energy policies with European objectives and national strategy. In consequence, taking into account the vast management area which the different national areas have in this sector, it is expected a profound progress in the next years at local and independent level.

- c) The community and national policy have proposed to achieve the maximum energy saving possible, by driving energy efficiency and renewal energies. A law in application linked to energy efficiency and solar energy came into force recently, developing the need for a new professional body specialized in the area of energy efficiency in building, with competencies in professional activities linked to solar power plants.

CHAPTER III.- Vocational training in teaching and context foundation parameters.

a) General objectives

The general objectives of this vocational training are as follows:

- a) Identify and characterized hot and cold generators, fans, circulators, and other components of the thermal and lightning plants, analyzing identity plates, working manuals or direct measurements, to continue assessing its power energy efficiency.
- b) Identify and characterize equipment, parts and power energy saving systems, quantifying a development in power energy saving, to incorporate in the plant design and improvement of thermal plants.
- c) Identify and characterize equipment and parts of lighting systems, quantifying the development of energy saving, and to incorporate them in the plant design and improvement.
- d) Analyze enclosure typologies and their characteristics, assessing their hygrothermal behaviour, to verify that the surrounding of the building complies with the required regulations.
- e) Analyze the typology of installations of sanitation of hot water, heating, air-conditioning and lighting in buildings, estimating their energy saving capacity to value its contribution to the procedure of power energy qualification.
- f) Simulate thermal behaviour of buildings and its installation, by using computerized applications, to obtain the buildings energy power qualification.
- g) Analyze the administrative guideline procedure in order to follow interpreting the regulations to obtain the power energy efficiency award of different buildings.
- h) Select specific details of the plumbing installations of hot water in buildings, interpreting the technical manual or measurements to assess its operation and to promote savings and correct usage.
- i) Produce report proposals and technical memorandums to improve thermal installations by using computerized applications, to contribute towards saving and correct usage.
- j) Analyze regulation demands on power energy supply and implementation of solar power installations, interpreting the relevant legislation.
- k) Select equipment and thermal solar power installation parts, applying the calculation procedure of power energy, in order to proceed to its configuration.
- l) Develop memos, plans and installations of thermal power energy plants, by using computerized applications, to elaborate and deal with the project documentation.
- m) Define and execute records and procedures of assembling, operating procedure and necessary recourses to control its operation.
- n) Define and execute records and maintenance procedures of thermal solar power installations, characterizing phases of operations and necessary recourses, and to plan and control its operation.
- o) Production of sales and operational manuals, which define characteristics, advantages and benefits of products and services, to promote efficient use of power energy and hydrogen technology.
- p) Analyze the regulations, energy plans and European, national and territorial policies; select the most relevant one, report and create consumers and professionals in the efficient use of power energy and hydrogen technology.
- q) Select techniques and methods of assessment of the vocational and informative delivery, making them relevant to the learners, to promote the efficient use of power energy and hydrogen technology.

- r) Analyze methods of work-related risk-prevention, safety and environmental protection in the use of materials, identifying the applicable regulations in order to intervene in the thermal installations.
- s) Describe the role of each of the components of the working team, identify in each particular case the responsibility assigned, in order to form the most suitable professional relationships.
- t) Identify methods of intervention in personal and work conflicts, making the appropriate decisions, to guarantee a pleasant working environment.
- u) Identify and value professional and training promotions, by assessing the service sector, in order to choose the most appropriate working and training route.
- v) Identify changes in technology, organization, finance and work changes in its activity; analyze its implications in a work context to maintain an innovative spirit.
- w) Recognize business opportunities, by identifying and analyzing market demands to create and manage a small company.
- x) Recognize rights and duties as an active member of a community by analyzing the legal framework which legislates social and working conditions in order to participate as democratic citizen.

b) Professional Modules.

1. This Vocational training consists on professional modules which follow (their development is included in Appendix I of this document).

0232 Industrial automatism. (192 h)
 *Hydrogen Technology I (192 h)
0234 Electrical engineering. (65 h)
0356 Work and Training guidance
0354 Promotion in the efficiency of power energy use.
0357 Management and initiative entrepreneurship.
 *Hydrogen technology II (180 h)
0349 Power energy installations efficiency. (110 h)
0123 Graphic design of the installations. (180 h)
0355 Power energy efficiency and hydrogen installations Project.
0358 Training in the workplace. (380 h)
 * Health and safety at work (65 h)

- They do not have a code assigned to them as they are new subjects and the code depends on the administration.

2. The Education Authorities will establish the appropriate curriculum keeping to the already established in this Real Decree and in accordance with Article 17 of the Real Decree 1538/2006, of 15th of December, for which is established the Vocational training of the Education System.

c) .-Space and facilities

1. The necessary space for the development of this vocational training is in Chapter X, article 52 RD 1538/2006.
2. Spaces will have the necessary area and it will be sufficient to develop teaching activities as a result of learning each one of the professional modules taught in each of the locations. Furthermore they should obey the following rules:

- a) The location will be allocated depending on the number of people which use this educational location, it should also be allowed the development of teaching and learning activities with the 'ergonomics' and mobility required inside the space.
 - b) They should cover the necessary furniture, equipment, and working aids required for the space.
 - c) They should respect spaces and security areas which the machines and operation equipment use.
 - d) It will be obey the regulations on work risks prevention, health and safety at work and any other regulations applied.
3. Training spaces allocated will be used by different groups of students on the same or other vocational training courses.
 4. The different training spaces should not be identified by enclosures.
 5. Equipment included in each space should be appropriate and sufficient to guarantee results of learning acquisition and quality of teaching to the learners. Furthermore they should comply with the following conditions:
 - a) Equipment (equipment, machinery, etc.) will have the appropriate installation for its correct operation, it will obey with safety regulations, risk prevention and however many apply.
 - b) The quantity and characteristics of the equipment will depend on the number of learners; it will facilitate the results of learning acquisition, taking into account assessment criteria and content included in each one of the professional modules taught in the spaces mentioned.
 6. The competent authorities will ensure that the spaces and equipment be suitable in quantity and the characteristics for the development process of teaching and learning from the learning results of the respective modules and therefore guarantee teaching quality.

- **Teaching staff**

1. The teaching of the vocational training modules which make out the teaching of this level is carried out by the teaching staff of the Body of Teachers of Secondary Education and the Body of Vocational Training Technicians, as it may seem appropriate the specialities determined in the Royal Decree Professors and the Body of Vocational Training Technicians/Specialist, according to the established specialities in the Royal - Decree.
2. The titles required to have access to the above mentioned Body of teaching, general specifications, are the established in the article 13 of the Royal Decree 276/2007, of 23rd of February, which approves the entering Regulation, access and acquisition of new specialities in the Educational Authorities to which the Education Law 2/2006 of 3rd of May refers to, by which it controls the progress of entering, which also regulates the provisional entering transfer of the mentioned legislation. The equivalent titles to the previously mentioned are to the same effect, for the different specialities of the teaching staff, the specified in the correspondent Royal Decree.
3. Specialist staff will be responsible for the teaching competence of the professional modules specified in the respective/relevant Royal Decree.
4. Specialized lecturers should comply with the general requirements established in the article 12 of the Royal Decree 276/2007, of 23rd of February, required to enter in the Public/state Education Teaching sector, which approves the entry Regulations, access and acquisition of new specialities in the body of teaching of which refers the 2/2006 Education Law, of the 3rd of May, which regulates the entry transmission regimen which regulates the progress which refers to the seventeenth regulation of the mentioned legislation.
5. Furthermore, with the purpose of ensuring that they respond to the requirements involved in the professional module, it is necessary that the specialized teaching staff authorized at the start of each nomination a professional experience recognized in their relevant field of study.

6. The necessary titles and requirements to teach the professional modules which constitute the title, for the teaching staff of private or state centres or other educational institutions, are included in the relevant Royal Decree. In any case it will require that the conducted teaching of the abovementioned titles include the objectives of the professional modules or accredited, by “certification” a working experience of, three years minimum, in the sector linked to the professional sector, by doing productive activities in companies linked implicitly with the learning outcomes.

7. The competent Authorities will ensure that the lectures/teachers who teach the professional modules comply with the specified requirements in order to ensure the quality of teaching.

CHAPTER IV.-

Access and linkage to other studies, and correspondence modular units with professional competence.

a) Preferences for access to this vocational course regarding the methods and subjects studied in Baccalaureate.

Preference access to this training programme will be given to those students who have studied modules of Secondary school in Sciences and Technology and within those, students who have passed Industrial Technology II.

b).- Access and link to other studies.

1. The title of Senior Technician in Energy Efficiency and hydrogen Technologies, direct access to study any other vocational training programme in Higher Education in the access requirements established.
2. The title of Senior Technician in Energy Efficiency and Hydrogen Technologies allows direct access to learning leading to university degrees within the entry requirements established.
3. The Government, once it has heard the Universities Council, will control, in a specific manner the approval of credits between Advanced Technician in Further Education and a university degree. In order to facilitate the recognition legislation, it has been awarded 120 credits ECTS on learning at Elementary level established in the Royal Decree respective to the professional modules of this vocational training.

c) Validations and exemptions.

1. It will be validated the professional modules, common to several vocational levels, which have the same characteristics, duration, content, learning objectives and assessment criteria, established in the royal decrees which determine the minimum learning requirements in Further Education. Nevertheless, according to the article 45.2 of the Royal Decree 1538/2006, of 15th of December, whoever might have achieved the Further Education vocational and training module or the professional module in Management and enterprise in any of the vocational training courses relevant to the titles established under the 2/2006 Education Organic Law 2/2006 of the 3rd of May, which will have those modules validated in any other vocational course which has been established under the same law.
2. The professional module in education or training of any award of Further Education will be subject to validation so long as it complies with the established requirements stated in the article 45.3 of the Royal Decree 1538/2006, of 15th of December, to accredit, at least, one year of work experience, and holds a Certificate of Work Risk Prevention Technician at Basic Level, issued according to the Royal Decree 39/1997, of 17th of January, which approves the Regulations in Services Prevention.
3. According to the established in the article 49 of the Royal Decree 1538/2006, of 15th of December, it will be possible to determine the total or partial exemption of the Vocational Training Professional module in places of work relevant to work experience, for as long as it accredits a work experience relevant to this vocational training course within the terms stated in the above article.

validation or exemption.

1. The relevance of the competence units to the professional modules which make up the teaching of the professional modules of Advanced/Higher Technician in Energy Efficiency and Hydrogen technology for its validation or exemption is included in Appendix II of this document.

First additional regulation. *Reference to the title in the European framework.*

Once established in the National Qualifications framework, following the European recommendations, it will be determine the relevant level to this award within the National framework and its European equivalent.

Second additional regulation. *Offer of this award as a distance learning programme.*

The professional modules which comprise the teaching of this vocational module will be offer as distance learning, providing that they guaranty that the learner will achieve its learning according to stated in the current Royal Decree. For this the Education Authorities, in their correspondent competences, will adopt the necessary measures and will dictate the precise instructions.

Third additional regulation: *Equivalent titles and links to professional capacities.*

1. The training provided in this Royal Decree in the professional module of working and training, prepares to carry out professional responsibilities equivalent to the activities required at basic level in risk prevention of accidents at work, stated in the Royal Decree 39/1997, of 17th of January, which approves the Legislation of Services Prevention, for as long as it has 45 hours contact time.
2. The training stated in the current Royal Decree, in the group of the Title professional modules, guarantees the required level of knowledge to contribute towards the development of the basic procedure of the Energy award regulated in the Royal Decree 47/2007, of 19th of January.

Fourth additional regulation. *Profession practice legislation.*

In accordance with what is established in the Royal Decree 1538/2006, of 15th of December, which states the general structure of the vocational training in the education system. The sections registered in the previously mentioned Royal Decree, does not constitute a legislation of the practice in any titled profession.

Fifth additional regulation. *Equivalences regarding entry selection procedure to the Body of Teachers of Engineering in Further Education.*

The title of Advanced Technician or Specialist Technician it is stated to be equivalent to the titles required to access to the Body of Teachers of Engineering in Further Education, provided that the qualified had exercised as a supply teacher in Local Authority/Government institutions from the applying Authority and in the teaching speciality he intends to apply for a minimum period of two years before the 31st of August 2007.

Sixth additional regulation. *Universal accessibility to the teachings of this award.*

1. The Education Authorities, in the field of their corresponding competencies, will include in the curriculum of this vocational course the necessary elements to ensure that the learners develop the competences included in the curriculum designed to everybody (every learner).
2. Furthermore, the above mentioned Authorities will adopt the measures which they will consider necessary so that the learners are able to have access and study this vocational course in the conditions stated in the tenth final regulation of the Law 51/2003, 2nd of December, of equal opportunities, non-discrimination and universal access to people with a handicap condition.

Unique Regulation repeal. *Repeal/Abolition of regulations.*

It remains repeal that all and whatever many regulations of equal or lower level oppose to above stated in the corresponding Royal Decree.

Final first regulation. *Competency title.*

The current Royal Decree, it has basic characteristics, under the competencies which the Constitution attributes to the State in the article 149.1.1st and 30th of the corresponding Royal Decree.

Final second regulation. *Implementation of the new curriculum.*

The Education Authorities will implement the teaching of the new curriculum in the academic year following the approval of the article of the curriculum. Nevertheless, they will be able to anticipate the implementation of this vocational course in the academic year, coinciding with the publication of the school academic year.

Professional Modules

Professional Module: Industrial Automatism.

Code: 0232

Credit Transfer: ECTS:5

Learning outcomes and assessment criteria.

1. Determines the procedure to follow in the mechanized operation, interpreting manuals and the use of technical documentation.

Assessment criteria:

- a) the symbology and the manual technical specifications have been identified.
- b) the different views, sections, sections and details have been identified.
- c) materials (profiles, covers, frames and other components have been identified.
- d) an assembling plan has been carried out.
- e) tools, technical means of safety in accordance to the requirements for each intervention have been analysed.
- f) the time to carry out each procedure has been taken into account.

2. Draw the basic elements and sets by applying the regulations.

Professional Modules

Professional Module: Industrial Automatism.

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1. Determines the procedure to follow in the mechanized operation, interpreting manuals and the use of technical documentation.

Assessment criteria:

- a) the symbology and the manual technical specifications have been identified.
- b) the different views, sections, sections and details have been identified.
- c) materials (profiles, covers, frames and other components have been identified.
- d) the stages and procedure operation have been identified.
- e) an assembling plan has been carried out.
- f) tools, technical means of safety in accordance to the requirements for each intervention have been analysed.
- g) the time to carry out each procedure has been taken into account.

2. Draw the basic elements and sets by applying the regulations.

Assessment criteria:

- a) sketches of the profile, covers, frames and other components have been drawn.
- b) figures have been shown.
- c) diagrams and plans, following regulations and conventions have been drawn.
- d) standardized symbology has been used.
- e) the display of parts and sets, by following the established measurements the distribution of the components and its measurements range have been taken into account.
- f) the distribution of the elements and its measurements in the performance carried out has been taken into account.
- g) CAD electrical engineering computerized programs have been used.
- h) quality control criteria have been followed.

3. Execute mechanized operations, by applying measuring techniques and register/stamp by using machines and tools.

Assessment criteria:

- a) a system of mechanization has been determined.
- b) tools, and technical and safety procedures have been selected.
- c) measurements with the required accuracy have been carried out.
- d) tasks of distribution, sketch and register have been executed.
- e) tasks with specific working tools and sets have been carried out.
- f) tasks of mechanization in streamline, covers, panels and conducts/pipes have been carried out.
- g) hazards which have arisen have been resolved.
- h) a report of the mechanization plan has been prepared.
- i) time available has been calculated to carry out the procedure.
- j) quality control has been followed.

4. To form basic handling and power circuits by selecting its components and elaborating diagrams.

Assessment criteria:

- a) they have been described the starting, reversal and control speed of the three phase and single phase engines.
- b) they have been described the operating mechanism principles and the characteristics of the mechanisms (functioning, control, protection and singling).
- c) the technical characteristics of the components of the installation have been calculated.
- d) the manufacturer's catalogues for the selection of materials have been used.
- e) control and power diagrams with adequate symbology have been produced.
- f) computer programs of CAD have been used.
- g) the normative of electro technique and the conventionalisms automatism have been applied.
- h) the foreseen process times have been taken into account.
- i) the quality criteria have been followed.

5. Assembles circuits of automatisms for operation of small engines by interpreting diagrams and verifying their operation.

Assessment criteria:

- a) control and power diagrams have been interpreted.
- b) each component has been related to its general performance.
- c) control and power circuits have been assembled.
- d) the electric engines have been connected to the power circuits.
- e) operations with engines have been accomplished.
- f) the established quality criteria have been applied.
- g) the proposed activities have been carried out with autonomy.
- h) the time has been taken into account considered for the activities.

6. Assembles tables and associated electric systems, interpreting the technical documentation and verifying its operation.

Assessment criteria:

- a) sketches tables diagrams and electrical systems have been interpreted.
- b) each component has been linked with its general performance.
- c) the elements, tools, technical and safety means have been selected.
- d) the elements in the tables have been distributed.
- e) the installing plate, sketch, outline, casing and piping have been mechanized.
- f) the mechanisms of the table and the components of installation have been fitted.
- g) the equipment and components of the installation have been connected.
- h) the operation of the installation has been checked.
- i) quality criteria have been established.
- j) the times estimated for each activity has been taken into account.

7. Find damages and malfunctions in the installation, by analyzing the symptoms and identifying the original causes.

Assessment criteria.

- a) an action plan has been produced.
- b) measures and verifications for the location of the failure have been carried out.
- c) the malfunctions of the installation by means of functional verification have been identified.
- d) the failure has been identified.
- e) the handling of components, equipment and tools has been performed with autonomy and skill.
- f) the intervention has performed in the required time.
- g) quality control has been applied.

8. Repairs failures and malfunctions in the in the installation, adjusting or substituting the faulty components.

Assessment criteria.

- a) a scheme of corrective and preventive intervention has been established.
- b) the failure has been repaired by substituting the components.

- c) the protections have been adjusted according to the characteristics of the receptors.
- d) the compatibility of the new installed component has been verified.
- e) the data has been registered in order to produce the repairing and invoice report.
- f) the conditions for normal operation have been re-established.
- g) the handling of the components of equipment and tools has been performed with autonomy and skill.
- h) the operation has been accomplished in the required time.
- i) the quality regulations have been applied.

9. It assembles and keeps working automatic systems with programmed control interpreting the technical documentation and assessing its operation.

Assessment criteria.

- a) the access, exists (analogical and digital) and their reference has been identified.
- b) the equipment and peripheral components of the system have been linked.
- c) the connection of the software to the programmable device has been established.
- d) basic controlled circuits with programmable robots have been carried out.
- e) control of synchronic engines with frequency converters has been carried out.
- f) the operation of the system has been verified.
- g) the malfunctioning in the basic automatic circuits with robots have been located and solved.
- h) the operations have been accomplished in the required time.
- i) the quality regulations have been applied in the intervention.

10. It fulfils the precautionary standards of working risks and environment protection control, identifying the related risks, procedures and preventive equipment.

Assessment criteria:

- a) the risks and level of danger have been identified which involve the handling of materials, tools, useful, machinery and means of transport.
- b) the machinery has been operated by following safety regulations.
- c) the most frequent causes of accidents in the handling of materials, tools, cutter to shape machinery, among others have been identified.
- d) the safety components (protections, alarms, emergency exists among others) have been described.
- e) the handling of materials, tools and machinery has been related to the personal and safety measures required.
- f) the personal security and safety which should be adopted in preparation and execution of the assembling and kept working automatic industrial systems and their related installations have been determined.
- g) the possible environment pollution sources have been identified.
- h) the waste generated by its collective removal has been classified.
- i) the organization and cleaning of installations and equipment as the first factor of risk prevention has been valued.

Duration: 192 hours

Basic Content:

Mechanization of tables and pipes.

- Specific materials for the mechanization of tables and pipes
- Types and plates characteristics used in tables
- Types and pipes characteristics used in piping
- Classification, election and usage of equipment and tools of mechanization.
 - Equipment, tools and securing components.
 - Tools, sketch, measurement and comparative instruments.
 - Equipment and tools of cutting and mechanization.
 - Interior and exterior cross thread shaped tools.
 - Drill and mould equipment and tools.
 - Equipment and tools for cutting, curving, and thread of pipes.

Interpretation of the technical documentation.

- Technical memory, certification of the installation, general usage and maintenance certification, among others.
- The symbology regulation and representation conventionalism in the installations of automatisms.
- Classification, selection and usage of equipment and mechanized tools.
- Application of technical drawing and calculation of installations computerized programs.
- Regulation and legislation.

Installations of Industrial automatisms:

- Characteristics of automatisms installations.
- Types of sensors. Characteristics and applications.
- Operators: RELES, pressers and detectors, among others.
- Power control: starting and handling of engines (mono-phase and tri-phase).
- Protection against short circuits and detectors among others.
- Starters and electronic speed modifiers.

Assembling of automated installations:

- Assembling of automated installations.
- Power circuits.
- Handling circuits.
- Cupboards assembling, electric and piping panels.
- Assembling of sensors and detectors, control components and operators, among others.
- Preparation, mechanization and operation of panels or cases, pipes, wires, terminals and connectors.

Automation with programmable robots.

- Structure and characteristics of programmable robots.
- Digital and analogical entrances and exits.
- Assembling and connection of programmable robots.
- Basic programming of robots.

Maintenance and reparation of installations of industrial automatisms:

- Types of maintenance used in installations of industrial automatisms.
- Types of failures in the installations of industrial automatisms.
- Diagnosis and location of failures.
- Failure repairs. Equipment used.
- Protection, safety and quality measures.

Working risks prevention and environment protection:

- Risks identification.
- Assessing measures of prevention of working risks.
- Prevention of working risks in the assembling and maintenance procedure.
- Individual equipment protection.
- Obeying with the regulation of working risks prevention.
- Obeying the regulations of environment protection.

Teaching guidelines.

This professional module contains the necessary training to carry out the assembling operation of installations of automatisms/robots in small industries.

The definition of these functions includes aspects such as:

- The interpretation and representation of schemes of automation.
- The mechanization of panels and pipes.
- The measure of electric magnitudes.
- The assembling of panels and related electrical systems.
- The assembling of installations to carry out start, manoeuvres and the control of small electrical engines.
- The assembling of systems with programmable automatisms.
- The programming of programmable robots.
- The verification and modification of the programs.
- The verification of regulation and control parameters.

The professional activities related to this operation are applied on:

- Installation and assembling of panels and peripherals of industrial robots/automatisms.
- Maintenance of the installations of industrial automatisms.
- Regulation and control of automated systems.

The training of the module contributes to reach the general objectives a), b), c), d), e), f), g), i), j), l), m), n), ñ), o), y q) of the vocational training and the competences a), b), c), d), e), i), j), k), l), y o) of the title.

The procedures for achieving the learning and teaching objectives will consider:

- The interpretation and design of electric schemes and technical documentation.
- The assembling of electrical panels and interconnections with electrical machines and other receptors.
- The assembling and programming of programmable robots.

- The verification and maintenance of automatic control systems by using as a resource the installations themselves.

-
Professional Module: Hydrogen Technologies I

Code: Management assignment

Credit Transfer ECTS: 15

Learning outcomes and assessment criteria

1. To familiarize with the global vision of the use of power and hydrogen as a vector of clean energy. The environmental problems caused by human activity, the CO₂ challenge, the greenhouse effect and the pollution in local areas. To familiarize with proposals about possible solutions: reduction of the demand before the distribution, increase of efficiency energy. To familiarize with the hydrogen economy, components of the system, benefits and challenges. To familiarize with the current regulation in hydrogen technologies and know have to apply it.

Assessment criteria

- To understand the scenery of the economy of the energy, demand and distribution of energy worldwide, available reserves and renewal energies.
- To understand the environmental problems provoked by the no renewal energy sources, such as emissions from greenhouse effect gases or air pollution.
- To understand the main solutions currently considered for the challenges linked to the energy.
- To acquire a vision of an economy based on hydrogen and debate its advantages and disadvantages.
- To evaluate the suitability of a new energy perspective based on the economy of the hydrogen.
- To identify the organizations responsible for the development of the standards.
- To identify the most important regulations related to the technologies of the hydrogen fuel cell.
- To acquire knowledge in order to be able to give innovative solutions to the problem of energy generation.

2 To become familiar with the hydrogen through its properties. To identify the most important properties of the hydrogen as well as its main differences with other gases used normally. To familiarize with the advantages and disadvantages of the hydrogen as an energy vector: calorific power, density, viscosity, vaporization temperature, pressurized steam, etc. to familiarize with the interaction of hydrogen with other materials.

Assessment criteria

- The learner is familiarized with the properties of the hydrogen and is aware of the conditions of hydrogen usage as an energy vector.
 - To know how to calculate changes in volume and the energy placed during the changes of state liquid – gas of the hydrogen.
 - To know how to select materials which are competent with the hydrogen.
 - To acquire knowledge to debate about hydrogen as an energy vector.
3. To know the different types of energy variables which describe the electrochemistry and calorific procedures. To know the Principles of the

Thermodynamics and the concept of energy efficiency. To make energy calculations and of efficiency in electrochemistry and thermal machines. To know the three forms of transference of heat and know how to do basic calculations.

Assessment criteria

- The learner recognizes the Gibbs free energy, the enthalpy or the work and knows how to do energy balances on a fuel cell and a thermal machine.
 - Recognizes and knows how to apply the principles of thermal dynamics and to preserve the mass.
 - each magnitude has been related to its correspondent unit in the International System and other unit systems.
 - The learner understands the concept of energy efficiency in theory and practice.
 - The learner understands the concept of global efficiency of the several consecutive procedures and knows how to estimate and calculate it.
 - To understand the practice application of the theory in the real world.
4. To familiarize with the different installations of hydrogen production. Electrolysers, alteration of fuel, solar energy, biomass.

Assessment criteria

- The learner knows the basics of the different methods of hydrogen production and its energy and economic cost approximately.
 - The learner knows the different parts which constitute a hydrolyser and its electrochemical base.
5. To recognize a problem related to the storage of hydrogen. The technology of hydrogen storage in solid, compressed and liquid form. To familiarize with the technology of handling, distribution, and gases contention. To familiarize with the distribution network and the hydrogen logistics. Hydro generator.

Assessment criteria

- To recognize the current methods of storing hydrogen, its advantages and disadvantages and the energy and storage cost.
 - To determine the most appropriate storage method for a specific application.
 - To identify equipment and installations used to distribute, store and handle compressed and liquidized gases.
 - To understand the factors implicated in safe operations. To identify good procedures for the safety and handling of the gases.
6. To recognize the technology of fuel cell. Electrochemistry bases of the fuel cell. Energy and mass balance. Types of fuel cells. Materials used in fuel cells. Piling of fuel cells. Types of fuel, conditions of distribution and procedure. Conditions of operating fuel cells. Characteristics and behaviour of fuel cells.

7. Assessment criteria

- To value the development of fuel cells.
- To understand some of the theories which underline the functioning and design of the fuel cells.
- To identify the proprieties of liquids and fuels used in the fuel cells.

Duration: 192 hours.

Basic content:

Hydrogen economy

Distribution and demand of energy worldwide

Reserves of energy worldwide

Development of renewal energy in Europe.

Environmental problems: CO₂ Global challenge: Risks, emissions, green house effect.

Local air pollution.

- Green house effect gases.

Problems of air pollution related to the use of fossil fuel.

- Acidification
- Photochemical pollution
- Matter Particles

The first solution. Reduction of demand against distribution.

- Conservation/efficiency of energy as a priority. Even in the hydrogen economy.
- Possibilities of reduction of emissions related to CO₂ according to sectors and regions.
- Cost of emissions of CO₂ reduction.

Economy of the hydrogen: Perspectives, Components of the system, benefits and challenges.

- The use of hydrogen today.
- Hydrogen, primary source of energy, converters and applications.
- Hydrogen: fuel cells, fuels and applications.
- General classification of the options of mitigation of green house effect gases.
- Future challenges of fuel cells.

Hydrogen: Physico-Chemical properties

Presence in Nature

Hydrogen production.

Physical and chemical properties of the hydrogen.

Industrial applications of the hydrogen.

Inflammability and explosion of hydrogen.

Interaction of hydrogen with other materials.

Concepts of thermodynamics and thermaltechnical

Preliminary concepts
The first thermal dynamic principle.
The second thermal dynamic principle.
Energy and its changes. Energy efficiency.
Electrochemical
Thermal machines.
Heat transfer

Hydrogen production

Electrolysis: Basic concepts; types of electrolyzers, components and characteristics;
current fuels: reform from natural gas; gasification.
Solar energy: thermal chemical cycles; photolysis, thermal solar cracking.
Production from biomass: gasification, pyrolysis, biological methods.

Storage and distribution of hydrogen

Characteristics of hydrogen related to storage

Storage in solid form: absorption (nanotubes); metallic hydrides).
Storage of compress gas.
Storage of cryogen fluid.
Hydrogen distribution systems.
Hydrogen logistics. Hydrogen.

Handling of the hydrogen

The handling of the compress gases and liquated cold gas.

- Basic definitions related to handling gases.
- General regulations for the handling of compress gases.
- General regulations for the handling of corrosive gases.
- General regulations for the handling of fluids and cryogen gases.
- General regulations for the handling of inflammable gases.
- General regulations for the handling of toxic gases and very toxic.
- Storage of safety of materials .

Handling and storage of gas cylinders.

- Storage of gas cylinders.
- Delivering of gas cylinders.
- Requirements for the handling of gas cylinders.
- Good practice in the handling of gas cylinders.
- Branding and inspection of gas bottles.
- Handling of gas compressed in bottles.

Gas pipes

Valves

- Valve Classification

Hydrogen sensors.
Pressure regulators.
Hydrogen sensors
Other equipment.
The problem of gas leak.
Importance of cleanliness in installations of compressed gas.
General regulation for the handling of hydrogen in NASA.

Fuel cells

Introduction

Fuel cells unicell.
Stack of fuel cells
Fuel cells systems.
Types of fuel cells.
 Fuel cells of high temperature.
 Fuel cells of medium temperature.
 Fuel cells of low temperature.

Operation of the fuel cell.

Gibbs free energy and Nernst potential.
Ideal behaviour
Energy balance
Theory efficiency in the unicell.
Tools of fuel cells diagnosis.
Polarization curve.
Turnoff current
Biological fuel cells.

Applications.

Standardization regulation

International regulation
Technical committee
Specific regulations Board.

Teaching Guidance.

This professional module contains the basic training to carry out planning, assembling and maintenance performances, and it is applied in the processes of hydrogen installations.

Planning, assembling and maintenance of hydrogen installations include aspects such as:

- Identification of installations equipment
- Definition of technical aspects and characteristics of the equipment.
- Installations assembling planning.
- Compliance of the current legislation.

The professional activities related to these performances are applied on:

- The constitution and calculation of the hydrogen installations from the draft.
- The supervision of assembling the hydrogen installations.
- The maintenance of hydrogen installations.

The training of the module contributes towards the achievement of the general objectives of the vocational training course and the professional competences, personal and social of the award .

The procedures for achieving the learning and teaching objectives will consider:

- The computation of power charging of the alleged hydrogen installations.
- The dimensions of the hydraulic machines in acclimatization and heating pumping.
- The computation of installations against fire.
- To emit basic judgments in the usage of several technologies in the production of energy.

Professional Module: Electrical Technology.

Code: 0234

Credit Transfer ECTS: 12

Learning Outcomes and assessment criteria

1. It carries out calculations in electric circuits of continuous current, by applying principles and basic concepts of electricity.

Assessment criteria:

- a) the characteristics of conductors, insulators and Semiconductors, by differentiating its behaviour have been identified.
- b) the main electrical magnitudes have been identified and their units have been used correctly.
- c) problems have been resolved about the Ohm law and the variation in the temperature resistance.
- d) power calculus, energy and electrical performances have been carried out.
- e) the electricity chemical and thermal effects have been approved
- f) diagrams of electrical circuits have been interpreted and carried out by using the standardize symbology.
- g) groups of resistance parallel-range have been simplified.
- h) computations have been performed in electrical circuits of CC which include connexions in series and parallel or in several loops.
- i) the characteristics and methods of connection of voltage and current meters have been identified.
- j) measures of voltage and current have been performed by following safety regulations in equipment and people.
- k) the proprieties and performance of capacitors have been recognised.
- l) groups of capacitors in series-parallel have been simplified.

2. It approves the Basic principles of electromagnetism, by describing the interactions between magnetic fields and electrical conductors and by relating the Faraday Law with the principle of operation of electrical machines.

Assessment criteria:

- a) the characteristics of magnets, as well as the magnetic fields they originate have been recognised.
- b) the magnetic fields created by the conductors routed by electrical currents have been recognised.
- c) basic calculations of magnetic circuits have been performed, by using the appropriate magnitudes and their units.
- d) the activities of a magnetic field over electrical currents have been recognised.
- e) the experiences of Faraday have been described.
- f) the induction of Faraday's law has been related to the production and operation of electrical energy.
- g) the phenomenon of auto-induction has been recognised.

3. Performs computation in electrical circuits of mono-phase alternating current (AC), applying the most appropriate methods.

Assessment criteria:

- a) the characteristics of sinusoidal signal have been identified.
- b) the characteristic valuation of AC has been approved.
- c) the relationship between voltage, current, and power in basic circuits of AC with resistance have been described, with pure auto-induction and with capacitance.
- d) They have performed voltage computation, current and power in circuits of AC with connection in current series, coupling coil and capacitors.
- e) They have drawn impedance triangles, voltage and power in circuits of AC with coupling series of resistance, and capacitors.
- f) It has been calculated the power factor of AC circuits.
- g) They have been performed measures of voltage, current, power and power factor by observing the safety regulation of equipment and people.
- h) It has been related the power factor with the consumption of electrical energy.
- i) It has been identified the power factor of fan installation corrective method.
- j) They have been performed computation of voltage reduction in AC mono-phase lines.
- k) It has been described the concept of resonance and its applications.

4. It performs computation in basic electrical magnitudes of a tri-phase system, recognizing the type of system and nature and type of receptors connection.

Assessment criteria:

- a) the advantages of triphasic systems in the generation and delivery of electric energy have been recognised.
- b) They have described the generation and distribution on three and four threads.
- c) They have been identified the two connection ways of triphasic receptors.
- d) It has been approved the difference between balanced receptors and unbalanced.
- e) They have been performed current computations, voltages and power in triphasic balanced receptors, connected in star as well as in triangle.
- f) They have been performed the security measures of equipment and people in the production of measures.
- g) They have been observed the safety regulations of equipment and people in the production of measurements.
- h) They have been performed improvement computations of the power factor in triphasic installations.

5. It approves risks and effects of electricity, by relating them to protection devices which must be used and with the installation computations.

Assessment criteria:

- a) the REBT and the application standard in the field of risks prevention have been handled.
- b) the disadvantages of the thermal effect of electricity have been acknowledged.
- c) the physiological risks of electro-shock in people have been acknowledged

- effects as well as in the related factors.
- d) the risks of fire by heating have been identified.
- e) the types of electrical accidents have been acknowledged.
- f) the risks from the use of electrical installations have been acknowledged.
- g) instructions for the use of workshops have been elaborated.
- h) the five golden rules for the production of work without voltage have been interpreted.
- i) the section of conductors of an installation by taking into account the prescribed regulations has been calculated.
- j) the necessary protections of an installation against high voltage currents have been identified.
- k) the protection systems against direct and indirect contacts have been identified.

6. It acknowledges the characteristics of the transformers by carrying out tests and computations/calculations describing its composition and operation.

Assessment criteria:

- a) They have described electric and magnetic circuits of the monophasic transformer.
- b) They have identified the nominal characteristics on the characteristics plate.
- c) They have carried out a test on vacuum in order to determine the transformation ratio and the loss in the iron.
- d) The test on short circuits has been carried out to determine the impedance of a short circuit and the losses in the copper.
- e) They have connected correctly the measuring apparatus in the tests.
- f) They have observed the appropriate safety measures during the tests.
- g) The performance has been calculated of the transformer which has been tested.
- h) The consequences of a short circuit accident have been deduced.
- i) The connection group to the connecting diagram of a triphasic transformer has been identified.
- j) They have described the conditions of coupling of the transformers.

7. It acknowledges the characteristics of direct current machines performing test and describing their composition and performance.

Assessment criteria:

- a) They have classified the direct current machines according to their excitation.
- b) They have interpreted the characteristics plate of the direct current machine.
- c) They have identified the elements which comprise inductor and induced.
- d) They have acknowledged the function of the collector.
- e) They have described the reaction of the induced and the compensation systems.
- f) They have measured the voltage of a rheostat starting.
- g) The polarity has been reversed from the winding, checking the inversion of the direction of rotation.
- h) They have observed the appropriate safety measures during the tests.
- i) They have interpreted the mechanical characteristics of a direct current motor.

8. It acknowledges the characteristics of the rotary machine of alternating current carrying out computation and describing its composition and performance.

Assessment criteria:

- a) They have classified the Rotary machines of alternating current.
- b) They have identified the components which constitute a motor of triphasic induction.
- c) They have interpreted the characteristics plate.
- d) They have described the connections of the windings relating them to the terminal box.
- e) They have established the difference of functioning of the treadmill rotors and winding.
- f) They have interpreted the mechanic characteristic of an induction motor.
- g) They have consulted the technical and commercial information of different manufacturers.
- h) They have produced verification calculation of the characteristics described in the technical documentation.

Duration:192 hours

Basic contents:

- Direct current:
 - Generation and consumption of electricity.
 - Electrical effects.
 - Insulators, conductors and semiconductors.
 - Electrical charges.
 - Electric circuit.
 - AC and DC.
 - International unit systems.
 - Electrical resistance.
 - The Law of Ohm
 - Resistance of a conductor.
 - Electrical output.
 - Electrical energy.
 - Chemical effect of electricity.
 - Thermal effect of electricity.
 - The Law of Ohm generalised for CC. Circuits.
 - Association of resistances.
 - Circuits with associations parallel series.
 - Circuits with various loops
 - Measures of voltage and current in CC circuits.
 - Insulating materials.
 - Operation characteristics of a condenser.
 - Capacity/capacitor.
 - Association of capacitors.
- Electromagnetism:

- Magnetism.
 - Magnetic field produced by a magnet.
 - Magnetic field produced by an electric current.
 - Interactions between magnetic fields and electric currents.
 - Power over currents situated in the interior of magnetic fields.
 - Induced electromotive forces.
 - Experiments of Faraday.
 - Faraday Law.
 - Direction of induced electromotive forces: Law of Lenz.
 - Currents of Foucault.
 - Auto-induced electromotive forces
- Monophasic alternating current:
- Characteristic values.
 - Behaviour of the Basic receptors (resistance, pure coil, capacitor) in monophasic AC.
 - Circuits of RLC series in monophasic.
 - Power in AC monophasic.
 - Power factor.
 - Resolution of circuits of AC monophasic.
 - Current measures, intensity and power in monophasic circuits.
- Triphasic Systems:
- Connection of triphasic generators.
 - Connection of triphasic receptors.
 - Power in triphasic Systems.
 - Correction of the power factor.
 - Voltage and current measures in triphasic systems.
 - Active volt-amperes in triphasic systems.
- Safety in electro technical installations:
- Safety standards.
 - Electro technical regulation for Low Voltage.
 - Computation of the conductors department of an installation, taking into account the heat.
 - Voltage line dropping.
 - Computation of the section of conductors of an installation by taking into account voltage dropping.
 - Electrical risk.
 - Protections in electro techniques and machines.
 - Electrical accidents.
- Transformers:

- Operating principle.
 - The monophasic transformer.
 - Tests on vacuum and short circuit.
 - Voltage drop.
 - The triphasic transformer.
- Direct current machines:
- Structure of the direct current machine.
 - Principle of operation as a generator.
 - Reaction of the induced.
 - Types of excitation.
 - Operation principle as a motor/engine.
 - Output torque.
 - Mechanic characteristics.
 - Inversion of direction of rotation.
- Rotary machines of alternative current:
- Types and usefulness of the alternators.
 - Structure of the triphasic alternator.
 - Operation principle of the triphasic alternator.
 - Composition and types of the asynchronous triphasic motor.
 - Principles of operation: Rotating field.
 - Mechanical characteristic.
 - Starting systems.
 - Reverse of direction rotation.
 - Monophasic Motors.

Teaching guidelines.

This professional module is a module of support, which responses to the need to deliver a suitable theoretical and practical background for the comprehension of the electrical and electromagnetic phenomena which rule the operation of the installations and electrical machines.

The training is of general character, for which the module can be common to different Titles/Awards of the Professional Body and even be used in Titles of other Professional Bodies which need basic electro technical training.

The definition of these roles includes aspects such as:

- To handle the appropriate tools (not only a scientific calculator, but technological applications).
- To use in a coherent and correct manner the appropriate units for each magnitude.

- To present the results of computation with the required precision.
- To use simulation technology tools to check results.
- To assemble circuits and to carry out measurements in them to check previous computations.
- To carry out reports on practices carried out which include an appropriate theoretic explanation, the performed computations and simulations, the measured results and the errors found.
- To be familiarized with its composition and elements, as well as with the different types and characteristics.
- To start and handle the electric machines.
- To perform tests type.

The training of the nodule contributes to reach the general objectives a), c), j), k), l), m), y n) of the vocational training course and the competences a), b), h), i), j), k) y l) of the title.

The procedures for achieving the learning and teaching objectives will consider:

- Knowledge of laws and basic principles of electricity and electromagnetism.
- Acquisition of techniques to carry out computations in DC electrical circuits, of monophasic AA and triphasic AC.
- Identification of electrical risks and the important of following always the appropriate security measures.
- Knowledge of electrical machines, their behaviour and operating characteristics, through computation as well as the fulfilment of tests type.

Professional Module: Work and training guidance.
Code: 0356

Credit Transfer ECTS: 5

Learning outcomes and assessment criteria.

1. Select opportunities of employment, by identifying the different possibilities of insertion and learning alternatives along life.

Assessment criteria:

- a) They have assessed permanent training as a key factor for the employability and adapting to the demands of the productive procedure.
- b) They have identified the professional-training routes related to the professional profile of energy efficiency and solar energy.
- c) They have determined the capacities and attitudes required to carry out the professional activity related to the profile of the title/award.
- d) They have identified the employment base and the work experience for Higher Technician in Energy Efficiency and Solar Energy.
- e) They have determined the techniques used in the procedure of employment search.
- f) They have foreseen the alternatives of self employment in the professional sectors related to the title.
- g) They have carried out the appraisal of personality, aspirations, attitudes and self training on decision making.

2. Apply team work strategies, appraising its efficiency for the achievement of the objectives of the organization.

Assessment criteria:

- a) They have appraised the advantages of team work in work situations related to the profile of Higher Technician in Energy Efficiency and Hydrogen Technologies.
- b) They have identified the working teams which can be formed in a real work situation.
- c) They have determined the characteristics of the efficient work team against inefficient work teams.
- d) They have positively appraised the necessary existence of roles diversity and assumed opinions for the members of a team.
- e) They have recognized the possible existence of a conflict between members of a group as a characteristic factor of the organizations.
- f) They have identified the types and conflicts and their resources.
- g) They have determined the procedures for the resolution of the conflict.

3. Execute the Rights and comply with the routes which derivate from working relations recognizing them in different work contracts.

Assessment criteria:

- a) They have identified the Basic Concepts of work Rights.
- b) They have distinguished the main organisations which intervene in the relations between employers and employees.
- c) They have determined the rights and duties as a result of working relations.
- d) They have classified the main contracting modalities, identifying the measures of encouraging contracting for specific collective actions.
- e) They have appraised the measures established for the current legislation for the reconciliation between family life and working life.
- f) They have identified the causes and effects of the modification, suspension and extinction of working relationship.
- g) They have analyzed the receiving of salaries identifying the main elements which make it up.
- h) They have analyzed the different measures of collective conflict and the procedures of conflict solution.
- i) They have determined the work conditions agreed in a collective settlement applicable to a professional sector related to Senior Technician in Energy Efficiency and Hydrogen Technology.
- j) They have identified the defining characteristics of the new surroundings of the organization of the work.

4. Determines the protective action of the Social Security System facing the different contingencies covered, identifying the different types of lending.

Assessment criteria:

- a) They have appraised the role of the Social Security as an essential pillar for the improvement of the quality of life of the citizens.
- b) They have enumerated the various contingencies which are covered by the Social Security System.
- c) They have identified the regimes in effect in the Social Security System.
- d) They have identified the obligations of the employer and the workforce within the Social Security System.
- e) They have identified in a hypothetical simplicity the basis of the quotation of a worker and the corresponding shares of a worker and the employer.
- f) They have classified the loans of the Social Security System, identifying the requirements.
- g) They have determined the possible legal situations of unemployment.
- h) They have carried out the computation regarding the duration and the amount lent for unemployment of basic contribution level.

5. Evaluate the risks derived from its activity, analyzing the work conditions and the risk factors present in the work environment.

Assessment criteria:

- a) They have appraised the importance of the preventive culture in all boundaries and activities of the enterprise.
- b) They have connected the labour conditions with the health of the worker.
- c) They have classified the risk factors in the activity and their derived damages.

- d) They have identified the most habitual risks in the work environment of the Senior Technician in Energy Efficiency and Hydrogen Technology.
- e) It has been determined the risks evaluation in the enterprise.
- f) They have determined the work conditions with significance for prevention in the work environment related to the professional profile of the Senior Technician in Energy Efficiency and Hydrogen Technology.
- g) They have been classified and described the types of professional damages with special reference to work accidents and professional illnesses related to the professional profile of the Senior Technician in Energy Efficiency and Hydrogen Technology.

6. Participates in the assessment for a plan of risk prevention in a small enterprise of the sector, identifying the responsibilities of all the agents involved.

Assessment criteria:

- a) They have determined the main rights and duties concerning the prevention of work risks.
- b) They have classified the different ways of managing the prevention in the enterprise, in function of the different established criteria in the regulation regarding the prevention of work risks.
- c) They have determined the forms of representation of the workers in the enterprise regarding the risks prevention.
- d) They have identified the public entities related to the prevention of work risks.
- e) They have appraised the importance of the existence of a preventative plan in the enterprise that includes the sequence of actions which must be carried out in case of emergencies.
- f) They have defined the content of a preventative plan in a work place related to the professional sector of the Senior Technician in Energy Efficiency and Solar Energy.
- g) They have projected a plan for emergency and evacuation of an enterprise of the sector.

7. Applies the preventative and protection measures, analyzing the risk situations in the work environment of the Senior Technician in Energy Efficiency and Hydrogen Technology.

Assessment criteria:

- a) They have been defined the preventative techniques for individual and collective protection which should be applied to prevent damages in their origin and minimize their consequences in case of these being inevitable.
- b) It has been analyzed the significance and scope of the different types of security signalling.
- c) They have been analyzed the performance protocols in case of an emergency.
- d) They have been identified the techniques for classification of casualties in case of an emergency where there could be different degrees of gravity.
- e) They have been identified the basic techniques for first aid which have to be applied in the place of the accident confronted with different types of damages and the contents and handling of the first aid kit.
- f) They have been determined the requirements and conditions for the vigilance for the health of the worker and its importance as a preventive measure.

Duration: 65 hours.

Basic contents:

Active search for employment:

_ Valuation of the importance of permanent training for the work and professional trajectory of the

Senior Technician in Energy Efficiency and Hydrogen Technology.

_ Analysis of the interests, aptitudes and personal motivations for the professional career.

_ Identification of the training route connected to the Senior Technician in Energy Efficiency and Hydrogen Technology.

_ Definition and analysis of the professional sector of the Senior Technician in Energy Efficiency and Hydrogen Technology.

_ The employment search procedure in enterprises of the sector.

_ Apprenticeship and employment opportunities in Europe.

_ Techniques and employment search tools.

_ The procedure of decision making.

Conflict management and work teams:

- Appraisal of advantages and drawbacks of the team work for the efficiency of the organization.
- Teams in the sector of energy installations in buildings according to the functions they perform.
- The participation in the work team.
- Conflict: Characteristics, sources and stages.
- Methods for the resolution or suppression of the conflict.

Work agreement:

_ Work Rights/The right to work.

_ Analysis of the individual working relations.

_ Types of work contracts and measures for the development of contracts.

_ Rights and obligations derive from labour relations.

_ Modification, suspension and extinction of a work contract.

_ Workers representation.

_ Analysis of a collective agreement applicable to the professional environment

of the

Senior Technician in Energy Efficiency and Hydrogen Technology.

_ Workers benefits in the new organizations: flexibility, social benefits, among others.

Social Security, Employment and Unemployment:

_ Structure of the Social Security System.

_ Determination of the principal obligations of employers and workers in the area of Social Security,

affiliation, temporary withdrawal from work (due to illness), return into active service and quotation.

_ Preventive situations in the protection for unemployment.

Evaluation of professional risks:

- _ Appraisal of the relationship between work and health.
- _ Analysis of risks factors.
- _ The evaluation of risks in the enterprise as a basic element of preventive action.
- _ Analysis of risks connected to the safety conditions.
- _ Analysis of risks connected to environmental conditions.
- _ Analysis of risks connected to ergonomic and psycho-social conditions.
- _ Specific risks in the sector of energy/energetic installations of buildings.
- _ Determination of the possible damages to the health of the workers which might derive from the specific risk situations.

Planning for the risk prevention in the enterprise:

- _ Rights and obligations regarding to the prevention of risks at work.
- _ Management of prevention in the enterprise.
- _ Public Entities related to the prevention of work risks.
- _ Planning for the prevention in the Enterprise.
- _ Emergency and evacuation plans in the work environment.
- _ Elaboration of an emergency plan in an enterprise in the sector of energy installations of buildings.

Application of prevention and protection measures in the enterprise.

- _ Determination of the individual and collective measures for prevention and protection.
- _ Action protocol in face of an emergency situation.
- _ First aid.

Teaching guidelines.

This professional module contains the adequate training for the student to integrate into the world work and develop his/her professional career in the sector of energy installations of buildings.

The training of the module contributes to achieve the general objectives q), r), s), t), y u) of the training course and the competencies m), p), q), r) and s) of the award.

The guidelines in the teaching and learning process which permit the attainment of module objectives will deal with:

- _ The handling of the sources of information on the education and work system, in particular with reference to enterprises in the sector of energy installations of buildings.
- _ The carrying out of tests of dynamic guidelines regarding the personality of the individuals and the development of social skills.
- _ The preparation and completion of the Curriculum Vitae (CV), and job interviews.

_ The identification of the work regulations which affect the workers in the sector, handling of the most commonly used contracts, comprehensive reading of the application collective agreements.

_ The completion of salary receipts of different characteristics and other related documents.

_ The analysis of the law in Occupational Risk Prevention, which allows an evaluation of the risks arisen from the activities developed in its productive sector, and to collaborate in the drawing up of a prevention plan for small enterprise as well as the necessary measures for their implementation.

Professional Module: Health and Safety in Equipment and hydrogen installations (1st)

Code: Assigned by the administration.

Credit Transfer ECTS: 7

Objective: To give a global vision of the most important risks related to the Hydrogen Technologies and its handling, as well as the regulations and measures to eliminate the risks and/or minimized them.

Learning outcomes and assessment criteria

1.- To analyze and evaluate safety and hygiene plans in hydrogen installations and in enterprises of the hydrogen technology sector.

- To familiarize with the main risks associated to hydrogen: combustion, by pressure, asphyxiation, by low temperatures, by contact with other materials, etc.
- To familiarize with the main risks which arise from the handling of electricity.
- To discriminate between direct and indirect electric contact.
- To familiarize with the main methods of protection against direct and indirect electric contacts.
- To compare the safety and hygiene plans of enterprises of the sector of hydrogen technologies expressing a critical opinion of each one of them.
- Starting from a certain number of safety and hygiene plans of a different complexity:

_ To identify and describe the most outstanding aspects of each plan, collected from the

documentation which contains it.

_ To identify and describe the risks factors and situations for the health and safety, contained in the plans.

_ To describe the roles of those responsible for the safety of the enterprise and the people who are assigned special duties in emergency cases.

_ To relate and describe the appropriate preventive measures and the prevention methods established to avoid accidents.

_ To evaluate the cost and necessary resources for the application of the studied plans.

- 2- To analyze the current regulation on hygiene and safety related to the sector of the hydrogen technology.

- To identify the rights and duties most relevant for the employee and the enterprise in the field of safety and hygiene.
- Starting from a certain number of plans of safety and hygiene of different levels of complexity:
 - _ To relate and describe the regulations relative to cleanliness and order in the work place.
 - _ To relate and describe the relations on symbology and physical location of signals and alarms, fire equipment and healing and first aid equipment.
 - _ To identify and describe the regulations for the stoppage and the internal and external manipulation of the systems, machinery and installations.

To relate the specific regulations of each analyzed plan with the current legislation, describing the breakdown, if there were one, between the general regulations and their applications or their finalization in the plan.

3. To define and utilize correctly safety procedures and equipment employed in the sector of the hydrogen technology.

- To define and classify possible kinds of decisions that can be use in face of concrete situations.
- Starting from a certain number of plans of safety and hygiene of different levels of complexity:

_ To relate and describe the regulations relative to cleanliness and order in the work place.

_ To relate and describe the relations on symbology and physical location of signals and alarms, fire equipment and healing and first aid equipment.

_ To identify and describe the regulations for the stoppage and the internal and external manipulation of the systems, machinery and installations.

_ To relate the specific regulations of each analyzed plan with the current legislation, describing the breakdown, if there were one, between the general regulations and their applications or their finalization in the plan.

- To describe the properties and uses of the clothing and the personal protection equipment normally used.
- To enumerate the different types of systems for extinguishing fires, by describing the properties and use of each one of them.
- To describe the characteristics and purpose of the signals and alarms which comply with the regulations.
- To describe the characteristics and usage of equipment and means aimed to healing, first aid, and transporting the victims of an accident.
- Starting from a certain number of possibilities describing different work environment:
 - _ To determine the specifications of the means and equipment of safety and protection.
 - _ To prepare technical documentation in which show the location of the emergency equipment, signals, alarms, and starting points in an emergency situation in the plant, adjusting it to the current legislation.

4. To carry out emergency activities and emergency activities against fires in accordance with the predetermine plan.

- Starting from a certain number of emergency drills in which fires of different nature are shown:

_ To use the equipment and most suitable for the extinction of each type of fire with the most efficient technique.

_ To use correctly the personal protection equipment.

_ To carry out the evacuation in accordance to the current regulations, complying with the assigned role in the established time.

5. _ To analyze situations of danger and accidents as a consequence of an incorrect or incomplete safety plan.

- Starting from a certain number of hypothetical theoretical situations in which it is endangered the security of the workers and the means and installations, in which they cause damages.
 - _ To identify the causes because of which the above mentioned security has been endangered.
 - _ To enumerate and describe the measures which would have avoided the accident.
 - _ To define an action plan to handle the situation created.
 - _ To specify the equipment and resources necessary to correct situation.
 - _ To prepare a report describing the discrepancies regarding to the current regulation or the lack of compliance.
 - _ To assess the damage cost.

6. – To analyze and assess real accident cases which occurred in the enterprises with hydrogen technology.

- To identify and describe the causes of the accidents.
- To identify and describe the risk elements and the measures which would have prevented the accident.
- To assess the responsibilities of the worker and the enterprise in the causes of the accident.

Duration: 65 hours.

Basic contents:

1. Hydrogen dangers.
2. Electricity dangers.
3. Protection measures.
4. Regulations.

Teaching Guidelines:

This professional module is a support module which has the common appropriate training to carry out the planning procedures, assembling and maintenance, and it is applied in the procedure of thermal installations and fluid installations.

The planning, assembling and maintenance of the thermal and fluid installations includes factors such as:

- The identification of equipment and of the installations.
- The definition of factors and technical characteristics of the equipment.

- The planning of the assembling of the installations.
- The fulfilment of the current legislation.
- The professional activities associated to these activities are applied
- The configuration and computation of thermal and fluids installations based on a draft.
- The supervision of the assembling of thermal and fluid installations.

The training of the module contributes to reach the general objectives a), b), e), k), l), m), n) y u) of the training course and the professional competences, personal and social a), b), e), f), i), j), k), l), y s) of the award/qualification.

The procedures for achieving the learning and teaching objectives will consider:

- The computation of thermal loads on suppositions of heating, refrigeration and acclimatization installations.
- The computation of air distribution networks in acclimatization installations.
- The computation of heating installations in different distribution systems.
- The production of refrigeration cycle of refrigeration installations.
- The measurement of hydraulic machines in dumping installations, acclimatisation and heating.
- The computation of fire prevention installations.

Professional module: Efficient use of energy promotion.

Code: 0354

Credit transfer ECTS:5

Learning outcomes and assessment criteria.

1. Prepare documentation and business activities for the promotion and selling of products and energy services by applying marketing techniques.

Assessment criteria:

- a) They have been produced selling manuals, selecting the different elements which constitute them.
 - b) They have been carried out arguments, specifying the characteristics, advantages and benefits of the marketed products and services.
 - c) They have produced a client's file, registering all the data of interest.
 - d) They have compared products and services of different enterprises of the sector, by making tables and presentations.
 - e) They have explained the aptitude which must be shown before the competition, in the preparation and carrying out of the interventions, by appraising the consequences.
 - f) They have described the elements of marketing, by detailing how they intervene in the business role.
 - g) They have explained the use of communications in business activities.
 - h) They have been applied different selling techniques, by systematizing their use.
 - i) They have appraised the importance of the method and self organization at work, by analyzing its advantages.
2. Plan activities to spread the use of energy efficiency and the hydrogen technologies, by producing and justifying the plans of circulation in a document.

Assessment criteria:

- a) They have explained the plans nationwide and the existing campaigns on the efficient use of energy and hydrogen technology.
- b) They have identified the clients, their environment and their demands, by using surveys, average tables.
- c) They have enumerated and discussed, technically and economically, the recommendations regarding the rational use of energy and hydrogen technology.
- d) They have been defined the objectives, real and adjusted to each situation, hydrogen saving.
- e) They have been selected the spaces, technological and didactic resources necessary for intervention.
- f) They have been estimated the cost of the activities.
- g) They have been described the necessary stops for the organization of the circulatory activities.
- h) They have been determined, sequenced and programmed the contents of a circulatory plan on the efficient usage and the habits of consumption, responsible for hydrogen energy.
- i) They have been elaborated reports, leaflets, presentations and proposals of the activities of information by using information and technology and communication.

2. It specifies and details the development of the circulation activities regarding the efficient use of energy and hydrogen technology, by establishing the criteria of implementation of the interventions, depending on how they are delivered to consumers, professionals, enterprises and organizations.

Assessment criteria:

- a) They have been established the criteria of space preparation, technology and teaching resources necessary to develop the activities.
- b) They have explained the basic functioning of the energy installations and the delivery of hydrogen for thermal installations.
- c) They have reported regarding to the diagnosis and auditions carried out on energy behaviour of buildings, as well as on efficiency and operation of energy and water and hydrogen installations.
- d) They have discussed the aim of energy saving and the use of hydrogen technology, by applying different proposals.
- e) They have produced a document with responses to the best possible questions and objections put across by the people targeted.
- f) They have established the usage criteria of technology and teaching resources in order to make more attractive and pleasant the performance/intervention.
- g) They have related the positive attitudes for the highest quality development of the intervention.
- h) They have exposed circulatory plans on the efficiency use and responsible consumption habits, of the energy and differentiating the level of technical preparation of the targeted.

4. It assesses the circulatory activities on the efficient use of energy and *the hydrogen technology*, by analyzing the documents generated and the reports produced during the entire promotion process.

Assessment criteria:

- a) They have produced assessment templates, adapting them to each type of intervention.
- b) They have designed questionnaires, surveys and reports in order to study the development and results of the activities.
- c) They have determined the criteria which will be used to assess the performance.
- d) They have analyzed the repercussions of the actions from the documentation drawn.
- e) They have appraised the level of compliance of the objectives selected.
- f) They have analyzed the causes which explain the deviation of the results obtained with the objectives.
- g) They have proposed technical reports, with the assessments conclusions.
- h) They have proposed the activities corrective improvement measures.
- i) They have maintained a constructive and objective attitude in all process of assessment.

Duration: 128 hours.

Basic contents:

Preparation of the documentation and business activities:

- Marketing. Market. Products. Price. Promotion. Distribution.
- Self organization at work. Advantages.
- Communications Techniques. Communications. sale manuals.
- Discussion. Client's files.
- Visits.
- Selling techniques. Hold conferences. Demonstrations, trail and testing.
- Treatment of objections.
- Closing of sale

Planning of circulation activities regarding the efficient use of energy and hydrogen technology.

- Nationwide plans of efficient use of energy and hydrogen technology.
- Communication campaigns on the efficiency use of energy and the use of hydrogen technology.
- Type of the targeted.
- Objectives and recommendations regarding the efficient use of energy and hydrogen technology.
- Meeting rooms.
- Technology and teaching resources.
- Computation of performance activities.
- Organization of circulation/divulcation activities.
- Plans of circulation/divulcation. Targeted. Objectives. Duration. Necessary resources.
- Contents. Order of the contents.
- Budget.
- Appendixes: leaflets, technique catalogues, diagrams.
- Production of documentation. Reports, leaflets, presentations, proposals.

Production of dissemination activities regarding the efficient use of energy and the hydrogen technology:

- Training in the intervention and use of resources.
- Exposition of circulation/divulcation plans.
- Technical conferences regarding energy and hydrogen.
- Argumentation: Characteristics, advantages and benefits.
- Dealing with questions and objections.
- Attitude during the intervention.

Assessment of dissemination activities regarding the efficient use of energy:

- _ Assessment template.
- _ Assessment criteria.
- _ Assessment tools.
- _ Repercussion activities.
- _ Degree of compliance of the objectives.
- _ Possible causes of the deviation of the results/objectives.
- _ Corrective measures.
- _ Reports of the results and improvement proposals.

Teaching Guidelines.

This professional module contains the necessary training to perform the role for the promotion of the efficient use of energy.

The aim of the promotion includes factors such as:

- The divulgation of the plans of energy efficiency.
- The production of information and training plans.
- Organizing conferences.

The professional activities associated with this role are applied on:

- The implementation of improvement in the use of energy.
- The diffusion of techniques and products connected to energy efficiency.

The training of the module contributes to reach the general objectives ñ), o), p) and r) of the training course and the competences ñ), o) and p) of the award/qualification.

The procedures for achieving the learning and teaching objectives will consider:

- Preparation of promotion activities.
- Exposition of dissemination plans..

Professional module: Enterprise and Innovation.

Code: 0357

Credit transfer ECTS: 4

Learning outcomes and assessment criteria.

1. Recognizes the capacities associated to the innovative enterprising, analyzing the requirements which derive from the work place and business activities.

Assessment criteria:

- a) They have identified the concept of innovation and its relation with the progress of the society and the increase in the wellbeing of the individuals.
 - b) They have analyzed the concept of enterprising culture and its importance as a source of creation of employment and social wellbeing.
 - c) They have appraised the importance of individual initiative, creativity, training and collaboration as indispensable requirements to be successful in the enterprising activity.
 - d) They have analyzed the capacity of innovation in the work of a person employed in a small and medium enterprise related to the energy installations of buildings.
 - e) They have analyzed the development of the enterprising activity of an employer who starts in the sector of energy installations of buildings.
 - f) They have analyzed the concept of risk as an inevitable element of all enterprising activity.
 - g) They have analyzed the concept of employer and the requirements and the necessary attitudes to develop the activity of business management.
 - h) They have described the business strategy relating it to the objectives of the enterprise.
 - i) They have defined a specific business idea of the sector of energy installations of buildings which will be useful as a starting point for the production of a business plan.
2. Defines the opportunity of creating a small Enterprise, appraising the impact in the environment of activity and implementing ethic values.
 - 3.

Assessment criteria:

- a) They have been described the basic functions which are carried out in an enterprise and it has been analyzed the concept of system applied to the enterprise.
- b) They have been analyzed the main elements of the general environment which surrounds the company, in particular, the economic environment, social, demographic and cultural.
- c) It has been analyzed the influence in the business activity of the relationship with the clients, with the suppliers and with the competency, as the main parts of a specific environment.
- d) They have been identified the elements of the environment around a small and medium enterprise (SME).
- e) They have been analyzed the concepts of business culture and corporate image and their relation with the business objectives.
- f) It has been analyzed the phenomena of social responsibility of the enterprises and their importance as an element of a business strategy.

- g) It has been produced the social balance of a company related to the sector of buildings energy installations, and have been described the main social costs which produce.
- h) They have been identified, in enterprises connected to the sector of buildings energy installations, practices which incorporate ethic and social values.
- i) It has been carried out a study of economic and finance viability of a SME related to the sector of energy installation of buildings.

3. It carries out the activities for the constitution and starting of an enterprise, selecting a jurisdictional method and identifying the associated legal obligations.

Assessment criteria:

- a) They have been analyzed the different jurisdictional forms of the enterprise.
- b) They have specified the level of legal responsibility of the owners of the enterprise regarding to the selected jurisdictional form.
- c) They have differentiated the fiscal treatment established for the different jurisdictional forms of the enterprise.
- d) They have been analyzed the demanded procedures for the current legislation for the enterprise constitution.
- e) They have carried out an exhaustive search of the different aids for the creation of enterprises related to the sector of energy installations of buildings in the referenced locality
- f) They have included in the business plan everything related to the election of jurisdictional form, study of economic- finance viability, administrative procedures, help and subsidies.
- g) They have identified assessing routes and existing business administrations when starting a SME (small and medium enterprise).

4. It carries out activities of business and finance administration of an SME, identifying the main accountancy and fiscal duties and completing the documentation.

Assessment criteria:

- a) They have analyzed the basic concepts of accountancy, as well as techniques of recording the accountancy information.
- b) They have described the basic techniques of accountancy information, in particular what refers to solvency, liquidation, and profitability of the enterprise.
- c) They have defined the fiscal duties of an enterprise of the sector of energy installations of the buildings.
- d) They have differentiated the types of taxes in the fiscal calendar.
- e) They have completed the basic documentation of a business character and accountancy (invoices, delivery notes, orders, bills, etc.) for an SME of the sector of the energy installations of buildings, and have been described the circuits which the above mentioned documentation covers the enterprise.
- f) They have identified the main tools of banking finance.
- g) They have included the previous documentation in the business plan.

Duration: 96 hours.

Basic contents:

Enterprising initiative:

- _ Innovation and economic development. The main characteristics of the innovation in the sector of energy installations of buildings (materials, technology, organization of the production, among others.)
- _ Key factors of the entrepreneur: initiative, creativity and training.
- _ The performance of the entrepreneurs as employees of an SME (small and medium enterprise) related to the sector of the energy installations of buildings.
- _ The performance of the entrepreneurs as employers in the sector of the energy installations in buildings.
- _ The employer. Requirements to carry out business activities.
- _ Business plan: the business idea in the field of the sector of energy installations of buildings.

The Enterprise and its environment:

- Basic performance of the enterprise.
- The enterprise as a system.
- Analysis of the general environment of an SME (small and medium enterprise) related to energy installations of buildings.
- Analysis of the specific environment of an SME related to the sector of energy installations of buildings.
- Relations of an SME of the energy installations of building sector with its surroundings.
- Relations of an SME of the energy installations of building sector with the group of a society.

Creation and start of an enterprise:

- Types of enterprise.
- The physicality in the enterprise.
- Election of the jurisdictional form.
- Administrative procedures for the constitution of the enterprise.
- Economic viability and finance viability of an SME (small and medium enterprise) related to the sector of energy installations of buildings.
- Business plan: election of a jurisdictional form, study of the economic and finance viability, administrative procedures and management of help and subsidies.

Administrative procedure:

- Concept of accountancy and basic knowledge.
- Analysis of accountancy information.
- Fiscal duties of the enterprises.
- Administrative procedures of an enterprise of the energy installations of buildings sector.

Teaching guidelines.

This professional module contains the necessary training to develop own initiative in the field of business, either in self employment or carrying out responsibilities and duties as an employee.

The training of the module contributes to achieve the general objectives t), u), v) y w) of the course of the training course and competencies r), s), t), and u) of the award/qualification.

The procedures for achieving the learning and teaching objectives will consider:

- The handling of information sources about the energy installations of buildings sector, including the analysis of the process of sectorial innovation in place.
- The performance of cases and group dynamics which allows understanding and appraising the attitudes of the entrepreneurs and adjusting their needs to the service sector related to the energy installations of buildings.
- The use of administrative business programs for SMEs (small and medium enterprises).
- The execution of a project of a plan for an enterprise related to the energy installations of buildings sector, and which includes all aspects of starting a business, as well as the justification of social responsibility.
-

Professional Module: Hydrogen technology II

Code: assigned for the administration

Credit transfer ECTS: 15

Learning outcomes and assessment criteria.

7. To compute the power demanded from installations based on fuel cells, using tables, diagrams and computerised programs.

Assessment criteria:

- a) They have related each magnitude with its correspondent unit in the International System and other units Systems.
- b) They have obtained the power demand of a house, business or installation from the plans, constructive details and project data.
- c) They have followed the regulations guidelines related to the type of installation.
- d) They have described the hybrid generation systems of electric and thermal energy, integrating renewable energies.
- e) They have collaborated between colleagues during the procedure of the tasks.

2. Determines the equipment and installations of production of electricity and heat energy based in the hydrogen technology, analyzing its operation and describing the performance which carries out each component of the group.

Assessment criteria:

- a) They know the characteristics of hydrogen and its production, storage and distribution/delivering.
- b) They know the different applications of the hydrogen technology and their suitability according to the requirements of the client.
- b) They have interpreted the result of the analysis of curbs characteristic of the fuel cell, relating them to the cell regulations.
- c) They have been described the different types of fuel cells and the parts which constitute them explaining their operation in the group.
- d) They have measured the fuel cell depending on the power demand and other design conditions.
- f) To understand the advantages of the cogeneration and identify a range of equipment.

3. To design the piping installation necessary for the operation of the fuel cells.

To determine the parameters which intervene in the transportation of fluids using tables, diagrams, abacus, and computerised programs.

Assessment criteria:

- a) They have analyzed the principles of the dynamic of fluids.

- b) They have analyzed the characteristics of the different materials of pipes, their application field and their compatibility with the fluids that transport.
- c) They have determined the parameters (diameter, loss of charge, speed and others) of the pipes of different fluids which circulate in a fuel cell.
- d) They have analyzed the characteristic curb of a circulatory pump interpreting its point of operation in an installation and its modification by using speed changers and equilibrium valves.
- e) They have analyzed the changing of the characteristic curb of two pumps placed in parallel or in series.

5. To know the auxiliary Systems which constitute the equilibrium of a plant of a fuel cell.

Assessment criteria:

- a) They have been analyzed the components of water conditioning, heat evacuation and automatic systems of regulation necessary in a fuel cell.
- b) They have been analyzed the different systems of detectors and alarm.
- c) They have been analyzed the different systems of extinction.
- d) They have been measured the auxiliaries of a production of heat installation (dilatation tank, storage reservoir of ACS, flowing pumps, valves and others).

Duration: 180 hours.

Basic contents:

Applications of the hydrogen technologies.

Back-up systems, automation, portable. Motors of hydrogen combustion. Mixing with renewable energies. Computing tools of insertion of hybrid systems.

Cogeneration

Generalities. Equipment of cogeneration. Study of the demand and measure.

Measure/gauge of fuel cells

Generalities

Study of the demand: Identify the consumption of the user (residential, business and public services) of power and energy. Measure/gauge of the plant Equilibrium. Maintenance of fuel cells.

Economic analysis

Estimate of investment cost.
Considerations of investment costs.
Annual balance of expenditure and credits/deposits
Analysis of profitability.

Analysis of sensitivity.

Simulation by computer, economic assessment and optimization of hybrid systems based on renewable sources.

Fluid Technology

Valving. Piping computation. Filters. Liquid recipients. Computation of transport of fluids network. Loss of charge, speed and volume flow. Types of pumps for fluids. Curb characteristic of a pump. Cleaning of pipes.

Plant equilibrium.

Management and conditioning of the water. Refrigeration systems. Control systems.

Configuration of the installations of fire prevention:

Classification of the detector Systems and fire alarm. Classification of portable extinction systems.

Classification and computation of the automatic extinction systems.

Teaching guidelines:

This professional module contains the common necessary training to perform the roles of planning, assembling and maintenance, and it is applied in the procedure of installation and maintenance of hydrogen installations design.

The planning, assembling and maintenance of the equipment of the hydrogen installations includes aspects such as:

- The identification of the equipment and the installations.
- The definition of the aspects and technical characteristics of the equipment.
- The fulfilment of the current legislation.

The professional activities associated with these roles are applied on:

- The configuration and computation of the hydrogen installations starting from the draft.
- The supervision of the assembling of hydrogen installations.
- The maintenance of hydrogen installations.

The training of the module contributes to reach the general objectives of the training course and the professional competences, personal and social of the award/qualification.

The performance guidelines in the teaching and learning procedure which allow achieving the objectives of the module will verse on:

- The computation of power charges on hypothetical hydrogen installations.
- The measuring of hydraulic machines in pumping, acclimatization, and heating installations.
- The computation of installations of fire prevention.

Professional Module: Energy efficiency of installations.

Code: 0349

Credit Transfer ECTS: 12

Learning outcomes and assessment criteria.

1. Evaluate the energy efficiency of heat generators characterizing the existing types and its performance.

Assessment criteria:

- a) They have characterized the heat generator by its plate and technical manual.
- b) They have checked the fuel and its combustion properties.
- c) They have carried out measures of fuel expenditure.
- d) They have analyzed the combustion fumes.
- e) They have checked the values measured with CO₂, CO and admissible opacity of emissions, among others.
- f) They have quantified the loss of useful energy in the system.
- g) They have determined the energy performance of the boiler or heat generator.
- h) They have determined the regulations of the functions of maintenance.
- i) They have proceeded with safety in the handling of heat generators.

3. Evaluate the energy efficiency of the thermal distribution systems checking the characteristic parameters in each case.

Assessment criteria:

- a) They have been characterized the distribution Systems.
- b) They have been carried out temperature, pressure and flow measures.
- c) They have been determined the parameters and properties of the state of the air and water.
- d) They have been carried out the measures of the electrical parameters in pumps and fans.
- e) It has been checked the state and quality of the pipe insulation, pipes and equipment by checking its leak-tightness.
- f) They have been quantified the energy equilibrium in the exchangers and unit terminals.
- g) They have been quantified the loss and useful energy in the system.
- h) They have determined the performance of the pumps and fans.
- i) It has been checked and corrected the hydraulic equilibrium of the network.
- j) It has been established the safety protocol in the inspection of thermal distribution.

4. Evaluate the systems of energy recovery which integrate the thermal installations, appraising the saving achieved with its use.

Assessment criteria:

- a) They have characterized the energy recovery systems existing in the market.
- b) They have selected the recovery equipment suitable for each installation.

- c) They have quantified the saving achieved with the recovery systems set out.
- d) They have taken into account the regulated specifications.
- e) They have rigorously carried out the computation.
- f) They have defined the maintenance necessary to preserve the efficiency of the recovery systems.

5. Rehearsal the operating strategy of the optimum performance of the installation, analyzing the contribution of the control systems to the improvement of the performance.

Assessment criteria:

- a) They have characterized the control Systems of the thermal installations and their components.
- b) They have determined the minimum requirements of the control system to ensure the compliance of the current regulations.
- c) They have determined the optional characteristics of the control systems which contribute to optimize the consumption of energy.
- d) They have defined the control strategy required for the installation.
- e) They have established the basic control points to optimize the performance of the installation.
- f) They have interpreted the configuration of the control system applied to the installation.
- g) They have defined the instructions of the performance parameters which must be controlled and their values.
- h) They have shown a reflective and critical attitude when defining the most appropriate control system for the installation.

6. Evaluate electrical installations for the feeding of the teams which intervene in the energy installations, applying regulation criteria, operational, and safety and efficiency.

Assessment criteria:

- a) They have identified the electrical elements of and installation and the diagrams of the correspondent panels.
- b) They have interpreted the electrical feeding diagrams, protection and handling of the thermal installations in agreement to allow a secure operation and according to the already established.
- c) They have defined the regulated specifications which must follow the circuits of electrical panels.
- d) They have carried out the measures of electrical alter using the equipments of a suitable measure.
- e) They have interpreted the measures carried out to detect the anomalous behaviour of the installation.
- f) They have analyzed the electrical risks derived from the handling of the installations and their consequences, adopting the required safety measures in each case.
- g) They have established the safety protocol in the inspection of the electrical systems of the installations.

7. Appraise the energy efficiency of the illumination installations in buildings, determining its energy consumption.

Assessment criteria:

- a) They have characterized the illumination systems of buildings, included the exterior lightning.

- b) They have determined the minimum requirements of efficiency of the illumination system, according to the current regulations.
- c) They have determined the performance of the lights.
- d) They have calculated the energy efficiency of the installation.
- e) They have analyzed the control and regulation systems to optimize the exploitation of natural light.
- f) They have established the regulatory maintenance activities.
- g) They have identified the electrical risks derived from the handling of installations of illumination.
- h) They have established the safety protocol in the inspection of lighting systems.

8. Elaborates proposals to improve the energy efficiency of the installations quantifying the energy savings achieved and analyzing its technical and economic viability.

- a) They have been compiled and selected data, measures and computations with reference to the efficiency of the installations.
- b) They have carried out the report of the diagnosis of the efficiency of different subsystems and installations.
- c) They have identified the critical points of the installations susceptible to improvement.
- d) They have compiled the reports of the diagnostic of the efficiency of installations and their subsystems indicating improvement alternatives.
- e) They have selected the most viable and efficient alternatives among the different proposals of improvement considered.
- f) They have elaborated proposals with alternatives and modifications of the installations and their subsystems.
- g) They have carried out memos and reports defining the solutions adopted and incorporating diagrams, plans and budget.
- h) They have quantified the energy saving foreseen and the recovery.
- i) They have elaborated information on the repercussions of the modification of the installation on the use and maintenance.

Duration: 110 hours.

Basic Contents:

Assessment of the heat generator systems:

- Exploitation of the systems of heat generation:
 - Generation of heat, combustion and fuel. Thermodynamics of gases. Analysis of fumes. Performance of the combustion. Demand of fuel. Usage autonomy.
 - Installations and heating equipment and hot water generation: procedures acknowledged for the storage of instantaneous and seasonal performance. Determination of consumptions. Regulated demand.
 - Measuring techniques in installations of heat generation.
 - Risks associated with the handling of heat generators.
- Assessment of the thermal distribution systems.
- Energy, heat and heat transmission. Dynamics of fluids. The air and water as means of heat carriers.

- Permeability of stem and water. Limitation of heat loss and control of condensation in pipes. Regulation demands.
- Water thermal circuits: elements of regulation and balance.
- Circulatory pumps: performance control.
- Heat interchangers: energy balances, efficiency and performance.
- Terminal units: characteristics and sensitive and underlying. Control systems. Efficiency and performance.
- Air Networks: elements of regulation and balance. Determination and limitation of heat loss and control of condensation in pipes. Regulation demand.
- Fans: control and performance.

Assessment of the Systems of energy saving:

- Energy recovery. Operation Systems.
- Recovery Systems of sensitive heat and enthalpy. Characteristics of each one and applications. Efficiency and performance. Regulation demand.
- Recovery systems of the environment of condensation: rings of condensation, cooling energy and air conditioners. Types and characteristics. Efficiency and performance. Applications. Regulation demands.

Demand of the control systems of installations:

- Regulation, control, measuring and accountancy of consumption for thermal installations.
- Interpretation and elaboration of diagrams.
- Measuring tools: Thermometers, thermal hygrometers, anemometer, barometers, hydrometers, manometers, vacuometers, flowmeters, calorimeter, plymeters, ammeter pliers, among others.
- Control points of an installation. Analogy and digital changers. Regulation and control sensor- performers: thermostats, hygrostats, pressure gauges, drills, pyrostats, flow meters, end of career, servomotors, among others. Elements of average control. Types, transference operations, knots, control algorithmeter.
- Configuration of a regulation and centralised control system. Regulation systems preconfigured and programmable. Systems SCADA. CPU, modules of exit and entrance A/D, reles cards, communication interface with PC. Telemangement.

Assessment of the electrical systems of the thermal installations:

- Interpretation and production of diagrams.
- Electrical components of protection, management and measure in the installation: magnetothermal, differentiators, contactors, thermal disjunctures,
- command relays, selectors, temporizers, timetable programmers,

- measure equipments, pressure and intensity transformers.
- Electrical lines of equipment/team supply. Compliance of regulations.
- Behaviour of receptor circuits. Power and its improvement factor.
- Techniques of measurement of electrical changers: interpretation of the results.
- Transformers and motors/engines: Types and characteristics. Efficiency and performance.
- Safety in the electrical installations.

Assessment of Systems of illumination:

- Techniques of measuring illumination changers.
- Interior illumination: illumination requirements, types of lights and energy efficiency. Consumption, computation of lights, lights distribution. Regulation compliance.
- Exterior illumination: illumination requirements, types of lights and energy efficiency. Consumption, computation of lights, distribution of lights. Regulation compliance.
- Illumination control and regulation Systems. Sensors and controllers.
- Maintenance and preservation.
- Safety in the installations of illumination.

Elaboration of proposals for the improvement of energy efficiency of installations:

- Compilation of data and measure of thermal and illumination installations.
- Consumption history, invoices, user's information, usage criteria.
- Techniques on data registry.
- Interpretation of data and characteristic parameters obtained in the inspections and tests of energy efficiency of the thermal and illumination installations.
- Diagnostic report of the present state of the installation.
- Efficient equipment. Classification and labelling of energy efficiency.
- Improvement alternatives of the generation systems, distribution and control of thermal installations.
- Systems of energy recovery: control ventilation, free-cooling, sensitive heat recovery, enthalpy recovery.
- Efficient systems in the configuration of illumination installations. Regulation and control systems. Exploitation of natural Light.
- Exploitation techniques of renewable energy.
- Limitation of the use of conventional energy in the installations.
- Regulation demands on energy efficiency. Regulation of thermal installations of buildings. Technical code of the building.
- Preventive maintenance criteria for the energy efficiency of the thermal installations.
- Analysis and proposal of solutions. Justifiable computation of the components of the proposed installation.
- Graphic and technical documentation, which reflects the present condition of the installation and its improvement.
- Memo or technical report, which provides with the computation, plans and other justifiable documentation.

- Study and energy saving foreseen with the improvement.
- Economic proposal of the proposed improvement and amortization.
- Economic appraisal of proposed solutions and prevision of amortization with the foreseen savings.

Teaching guidelines.

This professional module contains the necessary training to perform the role of inspection and assessment of the energy efficiency of the thermal installations and illumination in buildings and to elaborate proposals of modification for the improvement of its efficiency.

The efficiency and improvement of the energy efficiency of thermal installations and of illumination in buildings includes aspects such as:

- Taking measures of characteristic parameters.
- Consumption accountancy.
- Determining performance of the installations equipment/teams.
- Analysis and diagnosis of the conditions of operation of the installations and their subsystems.
- Location and selection of equipment and components of the installation susceptible to the improvement of its efficiency.
- Knowledge and selection of equipment and systems which contributes to energy saving.
- Analysis of technical and economic viability for the implementation of different proposals of modification and improvement of installations.

The professional activities associated to the role are applied in:

- The inspection and improvement of the energy efficiency of the thermal installations and the illumination of buildings.

The training of the module contributes to reach the general objectives a), b), c), q) and r) of the training course and the competencies a), b), c), g) and p) of the award/ qualification.

The procedures for achieving the learning and teaching objectives will consider:

- Knowledge of efficient operation of the thermal installations of the buildings.
- Knowledge of the composition and efficient operation of the installations of illumination.
- Knowledge of the composition and efficient operation of energy savings systems.
- Obtaining measurements taking and interpretation of the characteristic parameters of the equipment and thermal installations of buildings and illumination.
- Computation of energy balance and achievement of performance of equipment/teams and installations.
- Formalization of documentation and diagnosis of the installation.

- Configuration of proposal alternatives of modification of the installations.
- Elaboration of proposals of improvement of the installations energy efficiency.

Professional Module: Graphic representation of the installations.

Code: 0123

Credit Transfer ECTS: 7

Learning outcomes and assessment criteria.

1. Represents elements and equipment of thermal and fluid installations relating them to the standardised symbology of application in plans and diagrams.

Assessment criteria:

- a) They have identified the different types of plans (plants, power cut, sections, among others) which define the system.
- b) They have related the symbology of application with the system elements and equipment.
- c) They have identified on plans the elements and equipment which constitute the installation.
- d) They have interpreted the technical specifications which are contained within the plans in agreement with the general regulations of the representation.
- e) They have identified the single elements of the installation with the instructions contained in the corresponding heading/footnote.
- f) They have used ICT for the interpretation of Graphics documentation.

2. Produce diagrams of the principles of thermal and fluids installations using drawing programs supported by a computer.

Assessment criteria:

- a) They have defined the diagram with its characteristic information.
- b) They have produced lists of components of the systems.
- c) They have represented each element in agreement with the symbology of application.
- d) They have been incorporated footnotes/ headings.
- e) They have been considered the conventionalisms of representation.
- f) They have performed with neatness and cleanliness.
- g) They have carried out the diagram in the stipulated time.
- h) They have used ICT in the production of the diagrams.

3. Draw plans of the thermal and fluids installations applying conventionalisms of representation and programs of design.

Assessment criteria:

- a) They have selected the equipment, software and formats more appropriate to carry out the plans.
- b) They have established and organized the groups of the different types of circuits.
- c) They have elaborated sketches from real, local or buildings installations.
- d) They have taken into account the characteristics of the building.
- e) They have drawn the sketch of the installation.
- f) They have verified according to the regulations.
- g) They have incorporated the instructions and footnotes/headings.

- h) They have produced lists of their components.
- i) They have used ranges and regulated formats.
- j) They have identified the plan with its characteristic information.

4. Draw plans to detail and isometrics of installations describing the selected constructive solution.

Assessment criteria:

- a) They have selected the system of representation.
- b) They have selected the appropriate range to retail.
- c) They have represented the elements to detail (failure, sections, among others).
- d) They have been able to provide the figures according to the geometry in detail.
- e) They have used programs of design.
- f) They have performed with neatness and cleanliness.

Duration: 180 hours

Basic contents:

Representation of the components and equipment of thermal and fluid installations:

Graphic documentation. General regulations of representation.
Plans of building. Plan of the location. Plants. Price. Departments. Constructive details.
Terminology and symbology of the installations: calorific, refrigeration, acclimatization- ventilation, fluids network and associated systems.
Use of ICT.

Production of diagrams of thermal and fluids installations:

- Computerised programs of application.
- Elements of the diagrams.
- Electrical diagrams.
- Regulation and control diagrams.
-

Production of general plans of the thermal and fluids installations:

- Computerised programs of application.
- 2D drawing.
- General regulations of graphics representation.
 - o Formats.
 - o Ranges
 - o Types of cables.
 - o Prospects/Outlook/view
 - o Survey

- Specific regulation of application of thermal and fluids installations:
 - o Regulation of elements

- Network mapping
- Equipment location
- Single elements.

Production of detailed plans and isometrics of thermal and fluids installations:

- Computerised programs of application.
- 3D drawing.
- Isometrics for the assembly of installations.
- Graphic representation Regulations.
- Identification of materials.
- Failure, sections, and ruptures.
- Instructions and footnotes/headnotes

Teaching guidelines.

This professional module is a module of support which contains the necessary training to carry out the role of design applied in the process of the thermal installations and fluids in buildings and industrial procedures.

The Graphics representation of the installations associated to the role of design includes aspects such as:

- The identification of machines and equipment of installations.
- The analysis of technical documentation.
- The development of plans and diagrams of thermal installations.

The professional activities related to this role are applied in:

- Project development of thermal installations.
- Planning of assemble and maintenance.
- Management of assemble and maintenance.
- Supervision of assemble and maintenance of installations.

The training of the module contributes to achieve the general objectives a), b), c), d), f), h), i), and l) and the professional, personal and social competences a), b), c), d), f), h), i), and k) of the award/qualification.

The course of action in the process teaching and learning which permits to achieve the objectives of the module will verse on:

- The identification of symbology of the elements and components of the thermal installations equipment.
- The analysis of the operation of the installations.
- The representation of parts and diagrams of installations of equipment and machines by applying techniques of CAD.
- The production of group plans and details of thermal installations.
- The application of computerized programs in the outline of the diagrams of the elements of thermal installations.

Professional Module: Project of efficiency energy and hydrogen installations.

Code: 0355

Credit Transfer ECTS: 5

Learning outcomes and assessment criteria.

1. Identify the needs of the productive sector, associating them with typical projects which are able to fulfil.

Assessment criteria:

- a) They have classified the enterprises of the sector by their organisational characteristics and the type of product or service they offer.
- b) They have characterized the typical enterprises indicating the organized structure and the roles of each department.
- c) They have identified the demands aimed at energy and hydrogen technology enterprises.
- d) They have appraised the business opportunities foreseeable in the sector.
- e) They have identified the type of project required to respond to the foreseen demands.
- f) They have determined the specific characteristics required for the project.
- g) They have determined the fiscal, labour and risk prevention obligations and their conditions of application.
- h) They have identified possible assistance and subsidies for the incorporation of new production technologies or of the service they propose.
- i) They have produced the work script which is going to be followed for the production of the project.

2. Designs a project related to the competences of Senior Technician in Energy Efficiency and Hydrogen Technology.

Assessment criteria:

- a) They have gathered correct information in the areas which are going to be dealt with in the project.
- b) They have carried out the study of its technical viability.
- c) They have established the objectives which are intended to achieve by identifying its aim.
- d) They have identified the areas or parts which form the project and its content.
- e) They have determined the necessary activities for its development.
- f) They have foreseen the material and personal resources necessary to carry out the project.
- g) They have been identified the finance requirements for its start.
- h) They have defined and produced the documentation necessary for its design.
- i) They have identified the factors which must be controlled to guarantee the quality of the project.

3. Plans the implementation or execution of the project, by determining the plan of intervention and the related documentation.

Assessment criteria:

- a) They have sequenced the activities by organizing them regarding to the needs of the implementation.
- b) They have determined the resources and necessary logistic for each activity.
- c) They have identified the needs for permits and authorizations in order to carry out the activities.
- d) They have determined the performance and exercising procedures of the activities.
- e) They have identified the inherent risks to the implementation by defining the plan of risk prevention and necessary equipment means.
- f) They have planned the assignation of materials and human resources and timetable to be performed.
- g) They have done the economic calculation which answers to the conditions of the implementation.
- h) They have defined and produced the necessary documentation for the implementation or execution.

4. Manages the project defining the procedure of monitoring and control.

Assessment criteria:

- a) They have assigned the exercising of the operations regarding to the established plan.
- b) They have defined the control and assessment procedure of the activities and interventions.
- c) They have defined the indicators of quality to carry out the assessment.
- d) They have defined the procedure to carry out the assessment of incidents which might occur during the performance of the activities, its possible solution and register.
- e) They have defined the procedure to manage the possible changes in the resources in the activities, by including the system of their registering.
- f) They have defined and produced the necessary documentation for the assessment of the activities of the project.
- g) They have established the procedure for the participation in the assessment of the users or clients and they have been produced the specific documents.
- h) They have established a system to guarantee the compliance of the list of conditions of the project when it will exit.

5. R&D programs in hydrogen. Who is who. International and national projects. Financing of international and national projects and search of public funding.

Duration: 66 hours.

Teaching guidelines.

This professional module complements the training of other professional modules regarding to context analysis, design and organization of the audit/inspection and its assessment planning.

The purpose of the analysis of context includes factors such as:

- Gathering of information.
 - Identification and prioritization of requirements.
 - Identification of the factors which facilitate or hinder the project development.
- The purpose of the design of the audit/inspection includes factors such as:

- Definition or adaptation of the audit/inspection.
- Prioritization and sequencing of the activities.
- Assessment planning.
- Documentation design.
- Customer care planning.

The purpose of the organization of the audit. Includes factors such as:

- Detection of demand and requirements.
- Programming.
- Management.
- Coordination and supervision of the audit.
- Preparation of reports.

The professional activities associated with these roles are applied in:

- The enterprises and organizations related to the energy efficiency of buildings and their installations.

The training module contributes to achieve all general objectives of the training course and all professional, social and personal competences of the award/qualification.

The course of action in the process of teaching and learning which permit to achieve the objectives of the module will verse on:

- Planning of the qualification/award competencies to complete in the place of work.
- Execution of team work.
- Problem solving
- Independence and initiative.
- The use of information and technology and communication.
- Self assessment of the work performed.
-

Professional Module: Training in the work place.

Code: 0358

Credit Transfer ECTS: 22

Learning outcomes and assessment criteria.

1. Identifies the structure and organization of the enterprise relating it to the production and commercialization of products and services which offers.

Assessment criteria:

- a) They have identified the organization structure of the enterprise and the roles of each of its areas.
- b) They have interpreted, starting from the organograms, organizational and functional relations among the different departments of the enterprise.
- c) They have identified the elements which constitute the enterprise logistic network: Providers, clients, production systems, storage and others.
- d) They have identified work procedures in the development of the productive procedure.
- e) They have related the competences of human resources with the production activity development.
- f) They have interpreted the importance of each element of the network in the development of the enterprise activity.
- g) They have identified the market characteristics, type of clients and providers and their possible influence in the development of business activities.
- h) They have identified the most frequent marketing channels of this activity.
- i) They have relating advantages and disadvantages of the enterprise structure against other type of business organizations.

2. Evaluates the energy efficiency of thermal and illumination installations and of its components, by determined its energy performance and proposing improvement actions.

Assessment criteria:

- a) They have characterized the components of the installation.
- b) They have determined the fuel and its characteristic parameters.
- c) They have obtained the flow data, temperatures, consumption and other characteristic parameters.
- d) They have quantified the losses of energy contributed to the system.
- e) They have determined the energy performance of the component or the installation.
- f) They have analyzed the control systems and their influence on the performance of the installation.
- g) They have produced the technical report of efficiency of the installation.
- h) They have specified the improvement alternatives on the constitution of the installation.
- i) They have applied the safety plan in the inspection of the installations.

3. Supports technically the energy of buildings qualification and certification procedure by carrying out simulations and computations of its energy behaviour.

Assessment criteria:

- a) It has been gathered the construction information of the building.
- b) It has been assessed the hygrothermal behaviour of the dams.
- c) It has been checked the compliance of the demand limitation of the energy demand of the building.
- d) They have computerised the energy qualification.
- e) They have been employed computer programs for simulation and energy computation.
- f) It has been produced the documentation of the energy of a building certification.
- g) It has been processed the documentation of the energy of a building certification.

4. It formalizes improvement proposals for the efficiency and saving in the thermal installations of a building.

Assessment criteria:

- a) They have achieved the hydraulic parameters and the quality of the thermal installations.
- b) They have analyzed the condition of conservation of the hydraulic installation.
- c) They have identified the maintenance audits carried out on the thermal installations.
- d) They have analyzed the characteristics of the recipients.
- e) They have checked the expenditure and operation of the apparatus and the installation with which it would obtain with recipients. An efficient performance.
- f) They have analyzed the improvement margin of the control systems.
- g) They have elaborated the diagnostic report of thermal installations.
- h) They have elaborated the improvement proposal of the thermal installations.

5. It formalizes projects of thermal solar installations by responding to legal demand and client's energy needs.

Assessment criteria:

- a) They have assessed the energy needs of the user/client.
- b) They have appraised the solar power in the location of the building.
- c) They have analyzed the different options of implementation of solar energy.
- d) They have formed a thermal solar installation/plant.
- e) They have produced the general outlined plans and in detail of the thermal solar installation/plant.
- f) They have produced a memo, terms of administration clauses, budget, study of safety at the remaining necessary documentation for the project.
- g) They have accomplished the process administrative documentation of the project.

6. It manages the assembly and maintenance of solar thermal installations/plants by responding to the legal demands and requirements of the client.

Assessment criteria:

- a) They have interpreted the project of assemble of the thermal solar plant.
- b) They have organized and controlled the provisioning and delivery of materials to the site.

- c) They have organized and controlled the re planting and assemble of the plant.
- d) They have supervised or carried out safety tests/checks, operation and put into service.
- e) They have organized and controlled the maintenance of the thermal solar installations.
- f) They have organized and applied a safety plan in the assembly and maintenance of the thermal solar plants.
- g) They have processed the documentation related to the assemble and maintenance of the thermal solar plants.

7. Promotes the efficient use of energy and hydrogen technology by organizing and carrying out circulation activities on products and efficient installations.

Assessment criteria:

- a) They have identified products, apparatus and installations/plants, high efficiency catalogues, available to the market place.
- b) They have produced sales manuals and support marketing promotion arguments.
- c) They have identified the targeted people of the publicity activity.
- d) They have planned publicity activities taking into account the regulation and efficiency put into effect.
- e) They have prepared the reference documentation.
- f) They have carried out the publicity activity.
- g) They have assessed the training activity.

Duration: 380 hours.

This professional module contributes to complete the competencies and general objectives, appropriate of this award/qualification, which have been achieved in the educational centre or to develop specific competencies difficult to achieve in the centre itself.

Appendix II

Mapping of the competence units accredited according to the established in the article 8 of the Organic Law 5/2002, 19th of June, with the professional modules for its validation.

Accredited units of competence.	Professional Modules validated.
UC1194_3: To assess the energy efficiency of building installation.	0349. Energy efficiency of the installations.
UC1195_3: To collaborate in the procedure of energy of buildings certification.	0350. Energy certification of buildings.
UC1196_3: To manage the efficient use of fittings of hot water in building.	035 Efficient Management of hot water fittings Management
UC1197_3: To promote the efficient use of energy.	0354. Promotion of the efficient use of energy and hydrogen technology.
UC0842_3: To determine the viability of projects of solar plants. UC0846_3: To develop thermal solar installations projects.	0352. Constitution of thermal solar installations.
UC0847_3: To organize and control the assembly of thermal solar installations. UC0848_3: To organize and control the maintenance of solar thermal installations.	0353. Assemble management of thermal solar installations.

Appendix III

Mapping of the professional modules with the units of competence for their validation.

Professional Modules achieved.	Units of competence creditable.
0349. Installations of energy efficiency.	UC1194_3: To assess the energy efficiency of the installations in buildings.
0350. Certification of energy in buildings.	UC1195_3: To collaborate in the procedure of energy certification of buildings.
0351. Efficient management of hot water fittings in buildings.	UC1196_3: To manage the efficient use of hot water fittings in edification.
0123. Graphic representation of installations.	UC0842_3: To determine the viability of projects in solar installations.
0352. Constitution of thermal solar installations.	UC0846_3: To develop thermal solar installations projects.
0122. Assemble of installations procedure.	UC0847_3: To organize and control the assembly of thermal solar installations.
0353. Assemble and maintenance of thermal solar installations management.	UC0848_3: To organize and control the maintenance of thermal solar installations.
0354. Efficient use of energy and hydrogen technology.	UC1197_3: To promote the efficient use of energy. .

Appendix IV

Module distribution and hours per course.

Duration: 1846 hours		
First Course	Second Course	
September-June 930 hours	September-March 536 hours	April-June 380 hours
Education centre		Work place
Modules	Hours per year	Weekly hours
<u>First level</u>	930	
Industrial automatism	192	6
Hydrogen Technology I	192	6
Electrical Engineering.	192	6
Vocational training and work placement.	65	2
Health and Safety in the work place.	65	2
Promotion of the efficient use of energy.	128	4
Enterprising and entrepreneurial initiative.	96	3
<u>Second level</u>	536	
Hydrogen Technology II	180	8
Energy efficiency of installations.	110	5
Graphic representation of installations.	180	8
Energy efficiency and Hydrogen installations project	66	3
Training in the work place/ Work placement.	380	Working Hours