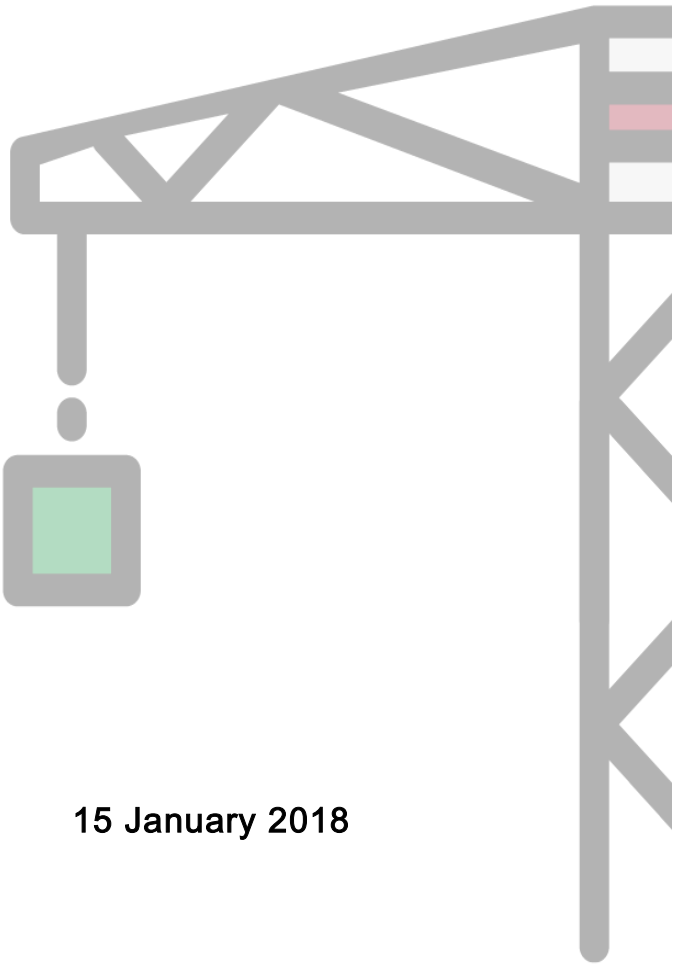
BUILDING UP GREEN SKILLS OF TRAINERS FROM THE CONSTRUCTION INDUSTRY

Qualification BuS Trainer

Work package 3; Result Nr 5

"Eco-Trainer in the construction industry"



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- The Gozo Business Chamber (GBC). Malta
- Malta Intelligent Energy Management Agency (MIEMA). Malta

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BUS.TRAINERS

BUILDING UP GREEN SKILLS OF TRAINERS FROM THE CONSTRUCTION INDUSTRY

1. EXECUTIVE SUMMARY

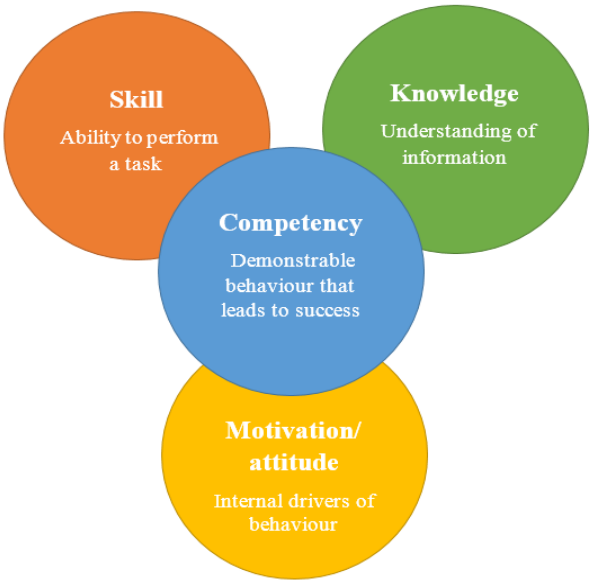
The objective of the project **"BuS.Trainers - Building up Green Skills of Trainers from the Construction Industry"** is to increase competitiveness in the construction sector through the promotion of skills and competencies on Energy Efficiency (EE) and Renewable Energy Sources (RES) in Vocational Training (VET) trainers, so that these "teachers" can then transmit the new knowledge and skills to the workers and future employees of the construction industry. Based on European trends, the skills development of VET trainers in energy efficiency and renewable energy systems is the necessary advance to address the weak link between education and innovation in EE and RES in the sector. The latest is due to a conscious attempt to contribute to the fulfilment of the EU's 20-20-20 objectives for energy until 2020, since, as established by the BUILD UP Skills initiative, the trainer is a core figure to raise awareness among pupils concerning environmental issues related to construction activities.

The "Eco-Trainer in the construction industry" Qualification is the second main output of the BuS.Trainers project. The report describes the new European sectoral qualification and the associated training contents for VET trainers acting in the construction industry, which contains skills for the promotion of EE and RES in buildings, while teaching training courses, as it was designed in the context of Work Package 3 (WP3) of the BuS.Trainers project. The work presented in the following sections is largely based on the previous main output of the BuS.Trainers project, namely the "The construction trainer profile on green skills", in which the Green Skills gaps of the trainers who are providing training on EE and RES topics in the construction industry have been identified and analysed. Also, it is based on the "Final green skills map and perimeter" (another output of WP2), which is actually a map of the key topics and subtopics that should be included in the training Curriculum (i.e. that the BuS Trainers should be taught), in order to fill in the identified gaps.

The development of the new qualification follows the EQF methodology, i.e. it is based on the 'Knowledge – Skills - Competences' (KSC) wide accepted approach. Besides, this output is based on the EQF and ECVET frameworks and guidelines, that is, the Curriculum has been designed for its correspondent EQF level, taking into account the complexity, range and level of learning achievement that is expected. In this sense, the "BuS Trainer in the construction industry" qualification contains the following essential elements:

- ✓ Description
- ✓ Working context
- ✓ EQF level
- ✓ General competence
- ✓ Learning units and their corresponding learning outcomes in terms of (factual) knowledge, skills and competences (+ attitude)

✓ Hours of total learning, including contact hours, hands-on practice, self-study and assessment, and allocation of respective ECVET points.



ESSENTIAL ELEMENTS OF A PROFESSIONAL QUALIFICATION

Before proceeding further, it is important to remind here that, based on the EQF level descriptors, the three pillars of KSC are defined as follows:

- **Knowledge**: Factual and theoretical knowledge in broad contexts within the field of work or study.

  Else: The understanding of basic, factual and theoretical information[1].

- **Skills**: A range of cognitive and practical skills required to generate solutions to specific problems in the field of work or study.

  Else: Application of acquired knowledge and understanding in different contexts[1].

- **Competences**: a) Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; b) Supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities.

  Else: Combination of knowledge and skills, associated with the level of autonomy and responsibility that the person is expected to have at that level[1].

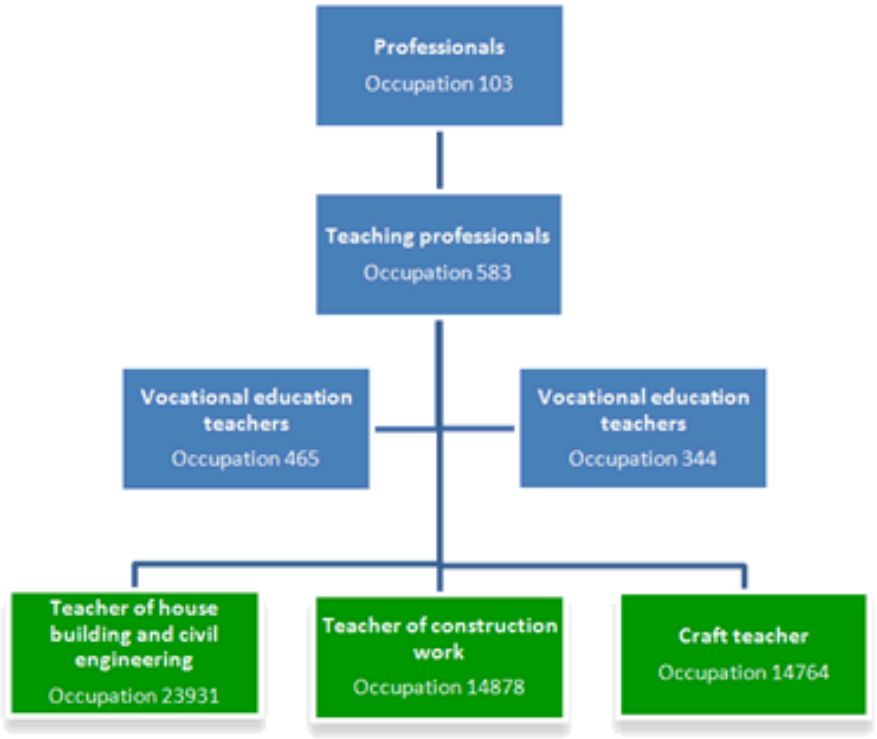
[1] Manual for the Conversion of Qualifications into the ECVET System. Available: http://eupa.org.mt/wp-content/uploads/2015/07/ECVET-Conversion-Manual.pdf

2. INTRODUCTION AND OBJECTIVES

2.1 GENERAL AIM OF THE TRAINING PROGRAMME

Based on the qualification perimeter defined in WP2 (Task 2.3) of the BuS.Trainers project, a new European sectoral qualification and the associated training contents for VET trainers acting in the construction industry is designed here (in the frame of WP3 of the project). This new sectoral qualification, the "BuS Trainer in the construction industry", will contain skills for the promotion of Energy Efficiency (EE) and Renewable Energy Sources (RES) in buildings, while teaching training courses.

A key point to consider when developing the Knowledge, Skills and Competences of the Qualification is the **European Qualifications Framework** (EQF) level. In the beginning this was thought to be between levels 4 and 7. Therefore, the European Skills, Competences, Qualifications and Occupations (ESCO)[2] had to be checked in order to identify if this classification specifies exactly the EQF level of Trainers for the Construction Sector. However, although the ESCO was thoroughly checked, nothing in this regard was found.

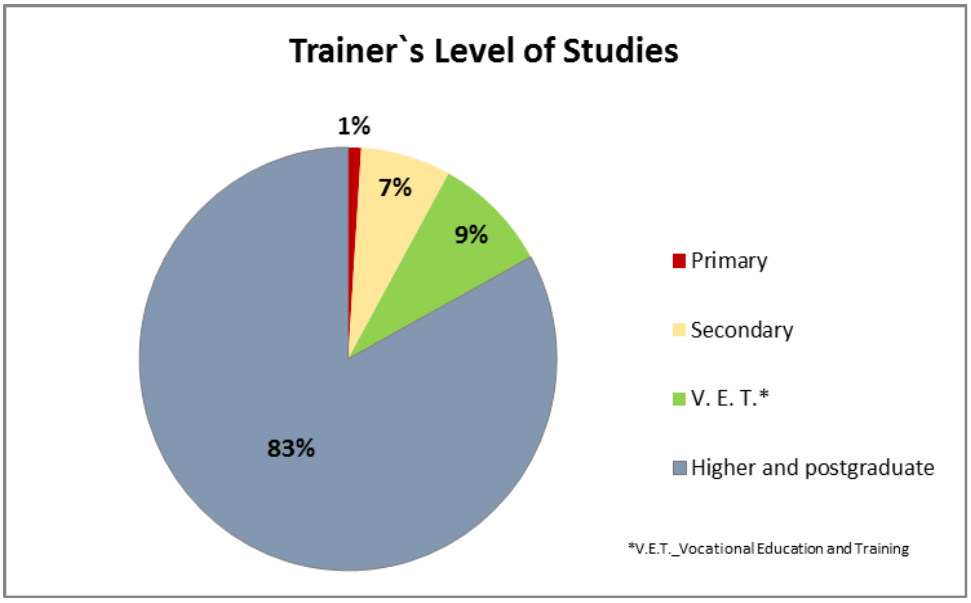


TRAINERS OF CONSTRUCTION SECTOR (ESCO)

On the other hand, trainers themselves defined the profile of teacher in need of green training by an on-line survey and a number of semi-structured interviews carried out in the

[2] https://ec.europa.eu/esco/portal/home

frame of WP2 of the BuS.Trainers Project. The results as regards the level of studies of the respondents to the on-line questionnaire (around 460 professionals) are presented in the following graph.



RESULTS OF THE BUS.TRAINERS SURVEY (WP2) RELATIVE TO THE TRAINERS' LEVEL OF STUDIES

As it is evident, 83.1% of the sample answered that they have a higher education and postgraduate education (PhD, Master and higher VET). So, taking into account the results of the survey made in the frame of WP2, an **EQF level 6** should be considered. The EQF qualification descriptors provided within the curriculum are based on Learning Outcomes in terms of the necessary knowledge, skills and competences which learners shall achieve by the end of a training course, which in the case of EQF level 6 are the following:

Knowledge, Skills and Competencies (i.e. 'Learning outcomes') descriptors for EQF Level 6

	KNOWLEDGE	SKILLS	COMPETENCIES
LEVEL 6 Learning outcomes	✓ Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	✓ Advanced skills demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specified field of work or study	✓ Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts ✓ Take responsibility for managing professional development of individuals and groups

To better support the transfer and recognition of assessed learning outcomes, the BuS.Trainer Training Curriculum also follows the technical components of the **European Credit System for Vocational Education and Training - ECVET**. Within this framework, the

definition of VET learning outcomes is organized as the required knowledge, skills and competences and is structured into specific 'Knowledge–Skills-Competences' (KSC) Units. Each of these Units can be subject to evaluation and autonomous validation, which facilitates incorporation into existing national qualification frameworks within partners' countries.

Furthermore, the ECVET approach promotes the assignment of credit points to the BuS Trainer professional profile, thus enhancing the compatibility between the different VET national systems. This will make it easier for professionals working in mentoring / coaching / training the 'blue collar' workers and technicians of the construction sector to obtain the validation and recognition of work-related skills and acquired knowledge independently of the learning context in which they have been developed.

2.2 SEQUENCING AND DISTRIBUTION OF PROFESSIONAL MODULES

The "BuS Trainer in the construction industry" Curriculum consists of a total of eight (8) Modules, each one consisted by a number of learning Units (3 for each one of Modules 1 to 7, and 8 for Module 8). The first seven of the training Modules are of purely technical nature and arose from the appropriate grouping of the topics and subtopics of the "Final green skills map and perimeter" (according to the needs for coverage of the identified skills gaps). The last Module (Module 8) deals with a number of Pedagogical and Soft Skills that were included in the survey of WP2 and a skills gap has been found for them too.

An overall learning time of **225 hours of learning** has been established, including direct contact hours, hands-on practice, self-study and assessment hours. For completeness purposes, it mentioned that, according to the prevailing terminology:

- Contact hours refer to theoretical (non-practical hours). In case of the live tele-conferencing contact sessions, if it is conducted in school setting and supervised, then it is considered as part of the contact hours.
- Self-study hours refer to the study of something by oneself without direct supervision or attendance in a class. In case of site visits, if not supervised, are considered as self-study.
- Hands-on hours refer to practical sessions, which can also be supervised. In case of site visits, if supervised, they are considered as hands-on practice.
- Assessment hours should include the time needed to prepare the assignment (e.g. if a student has to spend 6 hours reading a book in order to be able to work on an assignment, those 6 hours should be included). In the case of an exam, indicate only the time allocated to the exam, for example 2 hours.

As is presented in the below aggregate table, from the total time of the abovementioned 225 learning hours the 72 of them will be allocated to the so-called 'contact hours', i.e. the hours during which in-classroom or other type of training (e.g. e-learning / m-learning) will be provided. It must be further mentioned that, as the Bus.Trainers course is mainly aimed at experienced trainers who would like to specialize in the specific (technical) issues of sustainable construction, Module 8, in which the 'Pedagogical and Soft Skills' of the trainers are addressed, should not remain only at the theoretical level, but should be combined with

a problem solving methodology. For this purpose, the 'hands-on hours' for this Module (i.e. Module 8) are considerably increased, as the proposed 'problem solving methodology' (or 'practicing') is considered to be part of them.

	Contact hours	Hands-on hours	Self-study hours	Assessment hours	TOTAL
Module 1: Sustainable construction	10	5	14	1	30
Module 2: Certification and Labelling	8	4	12	1	25
Module 3: Materials	10	5	14	1	30
Module 4: Deconstruction	8	4	12	1	25
Module 5: Energy efficiency	10	5	14	1	30
Module 6: Renewables	10	5	19	1	35
Module 7: Life cycle	8	4	12	1	25
Module 8: Pedagogy	8	8	8	1	25
	72	**40**	**105**	**8**	**225**

As regards the already mentioned assignment of credit points (ECVET) to the "BuS Trainer in the construction industry", and following the ECVET Recommendation[3] to enable a common approach for the use of ECVET points for a given qualification in the EU, the allocation of ECVET points should be made as follows:

- Allocation of ECVET points to a qualification is based on using a convention according to which **60 points** are allocated to the learning outcomes expected to be achieved in **one year of formal full time VET**.
- It is up to the competent institutions in charge of designing qualifications to decide which specific programme will be chosen as a **point of reference** (e.g. the initial VET or the most common programme).
- The duration of the selected reference programme, together with the ECVET convention on ECVET points (60 points for 1 year), will give the number of ECVET points allocated to the qualification.

In this sense, and taking into account the widely accepted approach of **1 ECVET point (credit) = 25 hours of total learning**, which corresponds to an average of 1500 hours for 1

[3] RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2009 on the establishment of a European Credit System for Vocational Education and Training (ECVET) (2009/C 155/02)

year full VET (as applied, for example, in the Erasmus programme in the case of mobility of workers – also consistent with the ECTS model), the "BuS Trainer in the construction industry" Curriculum can be considered that foresees the allocation of **9 ECVET credits**. However, this is only indicative, as firstly the training program to be used as a reference should be decided, while the distribution of learning hours may need to be revised according to the national needs as well as the organizational frameworks of mentors, trainers, teachers and counsellors involved in the construction sector and/or the green - sustainable development.

3. TRAINING MODULES

MODULE 1: SUSTAINABLE CONSTRUCTION

LEARNING UNITS

Unit 1: Sustainable construction standardization

Unit 2: New technologies applied to building maintenance and refurbishment

Unit 3: Emerging technologies and digitalisation

Unit 1: Sustainable construction standardization

GENERAL DESCRIPTION

In the 1st Unit of Module 1 the principles of sustainable construction, including definitions, objectives, barriers to and benefits of the implementation will be taught to the trainees. It will be further provided to them a general overview of the main sustainable construction techniques and of the sustainability indicators used for assessing the sustainability performance of new or existing buildings, related to their design, construction, operation, maintenance, refurbishment and end of life.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the fundamentals on sustainable constructions (definitions, objectives, barriers, benefits)
	K2. Have acquired basic knowledge of sustainable construction techniques and the sustainability indicators used for assessing the performance of buildings
	K3. Have acquired basic knowledge about the sustainability assessment of buildings
Skills	S1. Be able to analyse sustainable construction principles, barriers and benefits
	S2. Be able to explain the principles of sustainable construction to others
Competences	C1. Understand and promote the value of sustainable constructions
	C2. Help professionals to understand the principles of sustainable construction
	C3. Raise awareness (own and among professionals) about sustainable construction

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction - Sustainability in the built environment	• Definitions of sustainable development, sustainable construction and sustainable building. • Worldwide efforts in sustainable development, sustainable construction and sustainable buildings. • The concept of high performance green buildings.
Sustainability of construction works	• Roles and responsibilities of building stakeholders • Active measures: - design /construction stages: green building / materials - building in use : importance of building maintenance • Passive measures: - legislations and regulations (e.g. on thermal, ventilation, electricity, etc.) - energy auditing and life cycle assessment
Sustainable construction techniques	Basics of: • Green roofs, • Solar passive systems, • Ground cooling system, • Mass walls
Traditional (bioclimatic) construction	Theoretical and working principles of bioclimatic architecture: The climate, human thermal comfort, solar heat gains and shading, natural lighting and natural ventilation in buildings.
Sustainability assessment of buildings	• Purpose of sustainability assessments: to gather and report information for decision-making during the phases of design, construction and use of a building. • State-of-the-art on sustainability assessment methodologies • ISO 15392: "Sustainability in building construction – General principles" • EN 15643-1: "Sustainability of construction works – Sustainability assessment of buildings - Part 1 to 4"

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 2: New technologies applied to building maintenance and refurbishment

GENERAL DESCRIPTION

The new technologies applied to buildings' maintenance and refurbishment (for example, preventive maintenance as a tool of building management, sustainable refurbishment of exterior walls and building facades with External Thermal Insulation Composite Systems – ETICS, etc.) and their importance for a better quality and performance of existing buildings (as regards both the energy and environment) will be presented and showcased to the trainees in the frame of this Unit of Module 1.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the fundamentals on the new technologies applied to building maintenance and refurbishment
	K2. Have acquired basic knowledge of main tendencies and possibilities in the new technologies for building maintenance and refurbishment field
Skills	S1. Be able to explain and demonstrate to others the new technologies applied to building maintenance and refurbishment
	S2. Research and update on the new technologies applied to buildings maintenance and refurbishment
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the new technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Maintenance principles	• Building management procedures: preventive maintenance, retaining equipment durability, safety procedures, operation and services • Building maintenance strategies (planned - proactive maintenance and unplanned - corrective maintenance).
Preventive maintenance	• Diagnosis of defects in materials, components; • Recognition of causes and selection of appropriate remedial methods. • Use of sensor data to monitor a system, and continuous evaluation of it against historical trends to predict failure before it occurs
New technologies applied for the sustainable refurbishment of buildings	New technologies related to: • insulation and related measures to reduce the energy consumption of buildings, • installation of renewable energy sources such as solar water heating and photovoltaic, • reduction of water consumption, • changes to reduce overheating, improve ventilation and improve internal comfort.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions

☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 3: Emerging technologies and digitalisation

GENERAL DESCRIPTION

In Unit 3 of Module 1, the emerging technologies applied in buildings construction (for example, installation of radio or wireless sensors in the construction materials, BIM modelling, use of augmented reality technologies and drones for fault diagnosis, etc.), especially those related to digitalisation, as well as their benefits and potential for better buildings monitoring, will be presented and showcased to trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the fundamentals on the emerging technologies applied to building construction
	K2. Be well aware of the main tendencies and possibilities in the building construction field
Skills	S1. Be able to demonstrate and explain to others the emerging technologies applied to building construction
	S2. Research and update on emerging technologies applied to building construction
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the emerging technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the emerging technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Impact of emerging technologies on the construction industry	• Presentation of the strategic business opportunities, risks and threats presented by emerging technologies and technological change on the construction industry. • The impact of emerging technologies on the industry: – Digital transformation and digitalisation – Automation technologies – New materials
Building information modelling (BIM)	• The concept of BIM: to build the project virtually, so that all facets of the project can be planned out before site construction begins. • Spatial coordination of all the materials, labour, and sequencing for the construction of the project.
Virtual and augmented reality	• Virtual and augmented reality differences. • Applications in construction (users can interact with plans, compare planned and actual completion, guide machinery, secure workers, and document progress).
Other emerging technologies	• 3D printing & laser scanning: By creating a digital image of the space, the design team can then manipulate the existing space virtually utilizing BIM, and then the proposed space can be overlaid back onto the existing to see the augmented one. • Use of mobile devices for data collection & communication in the field. • Use of drones and go pro cameras to monitor the construction site.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

MODULE 2: CERTIFICATION AND LABELLING

LEARNING UNITS

Unit 1: Environmental labelling

Unit 2: Energy labelling

Unit 3: Sustainable building certification systems

Unit 1: Environmental labelling

GENERAL DESCRIPTION

Trainees will be informed about the (voluntary) environmental labelling applied in the EU and internationally (for example, EU Ecolabel, Environmental product declarations), and why they are useful in the construction industry. Also the trainees will learn what an environmental label is, what different types of environmental labels exist in the market, and how the labels credibility can be guaranteed.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Know about the various types of Environmental Labelling
	K2. Be well aware of the principles of the basic environmental labelling schemes
Skills	S1. Be able to demonstrate and explain to others the (voluntary) Environmental Labelling
	S2. Apply effective communication styles to enhance the use of Environmental Labelling
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the use of Environmental Labelling in the construction sector
	C3. Raise awareness (own and among professionals) about the use of Environmental Labelling in the construction sector

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the existing environmental labels in EU	- EU Ecolabel - Voluntary - Other Ecolabels (Nordic Swan, Blue Angel, CO_2 emissions for cars, Organic farming, etc.) - Environmental Product Declaration Schemes (EPDs)
The European Ecolabel	• Products covered • Criteria: Environmental and serviceability
Environmental Product Declaration Schemes (EPDs)	• What is an EPD? • ISO 14025:2006 - Environmental labels and declarations • The European Committee for Standardization's Standard EN 15804:2012 - Sustainability of construction works • Various EPD and EPD-like schemes.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions

☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 2: Energy labelling

GENERAL DESCRIPTION

The mandatory Energy Labelling applied in the EU and internationally (for example, EU energy label, Building Energy Labelling) and its usefulness in the construction industry will be presented and showcased to the trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good knowledge about the various types of Energy Labelling
	K2. Be well aware of the principles of basic environmental labelling schemes
Skills	S1. Be able to demonstrate and explain to others the (mandatory) Energy Labelling
	S2. Apply effective communication styles to enhance the use of (mandatory) Energy Labelling
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the use of (mandatory) Energy Labelling
	C3. Raise awareness (own and among professionals) about the use of (mandatory) Energy Labelling

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the official Energy labels in EU	• The benefits of Energy Labelling • Applicability of mandatory energy labels. • The Energy Labelling legislation • Home energy performance
EU ENERGY STAR Programme	• A voluntary energy labelling scheme for office equipment • Main product groups with qualifying criteria: computers, displays, imaging equipment, UPS and enterprise servers
Energy labelling of buildings	• Directive 2002/91/EC on the energy performance of buildings. • Energy performance certificates (EPC) meaning & usefulness. • When an EPC is needed?

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 3: Sustainable building certification systems

GENERAL DESCRIPTION

The available sustainable building certification and/or rating systems in Europe and the rest of the world (for example, LEED, Green Globes, BREEAM, other national systems) and their benefits will be presented to the trainees during this Unit of Module 2.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the main principles of sustainable building certification and/or rating systems
	K2. Have acquired a good knowledge of the benefits of sustainable building certification / rating systems
Skills	S1. Be able to demonstrate and explain to others the key issues of sustainable building certification systems
	S2. Apply effective communication styles to enhance the use of sustainable building certification systems
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the use of sustainable building certification systems
	C3. Raise awareness (own and among professionals) about the use of sustainable building certification systems

OUTLINE OF UNIT CONTENTS

Contents	Description
The principles of sustainable building certification systems	Green building rating systems are a type of building certification systems that rate or reward relative levels of compliance or performance with specific environmental goals & requirements.
Building sustainability performance through Level(s)	• Introduction to Level(s) – a voluntary reporting framework to improve the sustainability of buildings / a tool for designing and constructing sustainable buildings - and how it works. • How to make performance assessment using Level(s).
The Leadership in Energy and Environmental Design (LEED)	LEED is a green building certification program used worldwide. It includes a set of rating systems for the design, construction, operation, and maintenance of green buildings, homes, and neighbourhoods that aims to help building owners and operators be environmentally responsible and use resources efficiently.
The Building Research Establishment Environmental Assessment Method (BREEAM)	BREEAM is a method of assessing, rating, and certifying the sustainability of buildings. The buildings are rated and certified on a scale of 'Pass', 'Good', 'Very Good', 'Excellent', 'Outstanding'.
Other building certification systems in Europe	Description of Verde certificate (Spain), HQE (France), Protocollo ITAC (Italy), SBtool-PT and LiderA (Portugal), others.
Other mufti-attribute Green Building rating systems	• Green Globes (originated in Canada and brought to the U.S. by the Green Building Initiative) • The Living Building Challenge (LBC) • NZEB (provided by the International Living Future Institute for a Net Zero Energy Building) • The Passive house (German: Passivhaus) • EDGE (Excellence in Design for Greater Efficiencies) • WELL (Certification promoting health & wellness in buildings)

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

MODULE 3: MATERIALS

LEARNING UNITS

Unit 1: Selection of construction materials and products in terms of sustainability

Unit 2: Low environmental impact materials

Unit 3: New and innovative materials

Unit 1: Selection of construction materials and products in terms of sustainability

GENERAL DESCRIPTION

The key factors affecting the selection of construction materials and products in terms of sustainability, a number of techniques to facilitate this selection, as well as the influence/ impact of this selection in buildings' performance will be presented to the trainees in this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good understanding of key factors affecting the selection of construction materials and products
	K2. Be well aware of how to select the appropriate construction materials and products in terms of sustainability
Skills	S1. Be able to demonstrate and explain to others the appropriate selection of construction materials and products in terms of sustainability
	S2. Apply techniques that facilitate the proper selection of construction materials and products
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the materials and products used in buildings
	C3. Raise awareness (own and among professionals) about the materials and products used in buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction - terminology	• Sustainable materials vs Recyclable or Green ones • Materials properties are defined as the tangible aspects, or actual measurable properties, of the chosen material. These aspects are directly related to the (physical) behaviour of the material and the production technique. • Many natural resources and building materials require mining, processing, refining and ultimately manufacturing, transport and delivery before they are utilised in construction. The energy used during these processes is commonly known as embodied energy.
Key building materials and their influence in the buildings performance	Introduction to the key building materials, their sources and their influence in the performance of buildings: • Limestone • Concrete • Steel • Aluminium • Bricks and Tiles • Petrochemicals • Wood
Key building equipment and its influence in the buildings performance	Most of the modern buildings are using machines, including plumbing, elevators, heating and air-conditioning systems. Brief description of the equipment that most frequently is used in buildings and of its influence in the performance of buildings.
Criteria for material selection	• Pollution prevention in manufacturing • Recycling of wastes in manufacturing • Reducing embodied energy and use of natural materials • Use of local materials • Energy efficiency • Use of non-toxic materials • Longevity, durability and maintenance of materials • Recyclability and reusability • Biodegradability

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 2: Low environmental impact materials

GENERAL DESCRIPTION

The low environmental impact materials (for example, materials with low emission of Volatile Organic Compounds – VOC, materials with low embedded energy, but also the so-called 'local materials) and their uses in construction applications, as well as the issues to be considered to their selection and examples will be presented and showcased to the trainees in the frame of this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the fundamentals on low environmental impact materials properties
	K2. Have acquired detailed knowledge of the available low environmental impact materials and their main uses
Skills	S1. Be able to demonstrate and explain to others the available low environmental impact materials and their main uses
	S2. Research and update on new tendencies in the field of low environmental impact materials
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the materials used in buildings construction
	C3. Raise awareness (own and among professionals) about the materials used in buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the low environmental impact materials	• General trends concerning the materials used in buildings construction • Classification of low environmental impact (i.e. Eco-friendly) materials • Key properties of the low environmental impact materials (health and/or environmental attributes).
Examination of low-impact materials	• Permeable materials (allow water to infiltrate and recharge aquifers, instead of being sent to combined stormwater and sewer systems) • Reflective, "cool," or white materials (help reduce air temperatures, and energy costs by minimizing the use of air conditioning to cool buildings) • Sustainable wood options • Sustainable concrete options
Local materials and their uses in construction applications	• Local materials (straw, stone, earth, clay mortar, lime mortar) and their uses in construction applications. • Compatibility with climatic, cultural and aesthetic conditions • Use of local materials (for example, straw, cork, wool) for insulation purposes. • Transportation impact (shortening of transport distances, thus reducing air pollution produced by vehicles).

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 3: New and innovative materials

GENERAL DESCRIPTION

In this Unit, the available or emerging new and innovative materials (for example, blocks with integrated insulation, self-healing concrete, phase-change materials, etc.), their uses and properties, will be presented and showcased to the trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the fundamentals on new and innovative materials properties and their trends
	K2. Have acquired detailed knowledge of the available new & innovative materials and their uses
Skills	S1. Be able to demonstrate and explain to others the new and innovative materials and their main uses
	S2. Research and update on new tendencies in the field of new/innovative materials
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new and innovative materials used in buildings
	C3. Raise awareness (own and among professionals) about the new materials used in constructions

OUTLINE OF UNIT CONTENTS

Contents	Description
Basic trends in new and innovative materials	• Temperature (heating/cooling) • Ventilation • Lighting • Illumination • Energy conservation • Low cost cum highly durable • Sustainable / green • Clean / cleanser
Materials list and their properties	• Smart materials: Piezoelectric, Electrostrictive, Magneto-strictive, Shape memory alloy, Optical fibres, Materials with added functions, others. • High-tech materials (transparent, lightweight, responsive)

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

MODULE 4: DECONSTRUCTION

LEARNING UNITS

Unit 1: Deconstruction techniques

Unit 2: Prevention of Construction and Demolition Waste (CDW)

Unit 3: Reuse and recycling of CDW

Unit 1: Deconstruction techniques

GENERAL DESCRIPTION

The main deconstruction techniques that contribute to sustainability by reducing the amount of Construction and Demolition Waste (CDW) in landfills and the extraction of natural aggregates, thus their environmental impacts, for example selective demolition, will be presented to the trainees during this Unit of the course.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the main principles of the available deconstruction techniques
	K2. Have acquired a good knowledge of the fundamentals on how to identify the appropriate deconstruction technique
Skills	S1. Be able to demonstrate and explain to others the appropriate deconstruction techniques
	S2. Identify the appropriate deconstruction technique for each case
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the available deconstruction techniques
	C3. Raise awareness (own and among professionals) about the available deconstruction techniques

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to deconstruction	• What is deconstruction • Feasibility and cost-effectiveness of deconstruction • Decisions to be made in the deconstruction planning process. • Basic steps to buildings deconstruction • Designing for deconstruction (DfD)
Deconstruction techniques	• Categories of deconstruction projects and their main features: – complete structural disassembly; – small soft-stripping project; – individual assembly project. • Typical methods of deconstruction (structural/non-structural)
Demolition plan	• Identifying hazards, • Assessing risks, • Determining appropriate control measures in consultation with all relevant persons involved in the work, including the principal contractor, demolition contractor, structural engineers and mobile plant operators.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 2: Prevention of Construction and Demolition Waste (CDW)

GENERAL DESCRIPTION

A general overview about the basic concepts driving the Prevention of Construction and Demolition Waste (CDW) and the existing relevant legislation, as well as of the more established internationally methods / techniques for the prevention of CDW will be presented and showcased to trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good knowledge of the prevention of CDW methods/techniques and relevant existing legislation
Skills	S1. Be able to demonstrate and explain to others the prevention of CDW methods / techniques
	S2. Recognise the suitable prevention of CDW methods/techniques per case
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the prevention of CDW methods/techniques
	C3. Raise awareness (own and among professionals) about the prevention of CDW methods/techniques

OUTLINE OF UNIT CONTENTS

Contents	Description
Prevention of CDW basic principles	• The advantages of integrative processes in waste prevention. • Fundamental information on 'lean' to maximize customer/client value, while minimizing waste through the life cycle of construction, renovation or demolition projects.
Legislative framework	• The Waste Framework Directive 2008/98/EC • EU Construction and Demolition Waste Protocol • EC Standardization Committee (CEN) EN 303 standards • Local laws/standards
Examples of waste prevention measures	• Measures that can affect the framework conditions related to the generation of waste • Measures that can affect the design and production and distribution phases. • Measures that can affect the consumption and use phase.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 3: Reuse and recycling of CDW

GENERAL DESCRIPTION

In this Unit, the established methods / techniques applied for the reuse and recycling of Construction and Demolition Waste (CDW), the kind of CDW materials that can be reused and/or recycled, as well as the issue of separation and sorting of CDW at the construction site will be presented to the trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good knowledge about the reuse and recycling of CDW methods and techniques
	K2. Be well aware of the kind of materials that can be reused and/or recycled
Skills	S1. Be able to demonstrate and explain to others the reuse and recycling of CDW methods
	S2. Recognize the kind of materials that can be reused and/or recycled
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the reuse and recycling of CDW materials
	C3. Raise awareness (own and among professionals) about the reuse and recycling of CDW materials

OUTLINE OF UNIT CONTENTS

Contents	Description
Definitions related to the reuse and recycling of CDW	• Preparing for reuse means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing; • Recycling means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes.
Separation/sorting of CDW at the construction site	• Factors affecting on-site sorting of CDW. • Available / applicable sorting processes. • Types of containers and machinery.
Commonly reused CDW materials and applications	• Easy-to-remove items like doors, hardware, appliances, and fixtures, which can be used during rebuild or on other jobs. • Wood cut-offs (used for cripples, lintels, and blocking to eliminate the need to cut full length lumber), scrap wood to be chipped on site and used as mulch or groundcover. • De-papered and crushed gypsum can be used, in moderate quantities, as a soil amendment. • Brick, concrete and masonry can be recycled on site as fill, sub-base material or driveway bedding. • Excess insulation from exterior walls can be used in interior walls as noise deadening material. • Paint can be remixed and used in garage or storage areas, or as primer coat on other jobs. • Packaging materials can be returned to suppliers for reuse.
Materials that can be recycled	• Asphalt, concrete, and rubble are often recycled into aggregate or new asphalt and concrete products. • Wood can be recycled into engineered-wood products like furniture, as well as mulch, compost, and other products. • Metals, including steel, copper, and brass, are also valuable commodities to recycle.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

MODULE 5: ENERGY EFFICIENCY

LEARNING UNITS

Unit 1: Efficient insulation

Unit 2: Efficient windows

Unit 3: Efficient lighting

Unit 1: Efficient insulation

GENERAL DESCRIPTION

In this Unit the importance of thermal insulation types and insulation systems requirements for the thermal performance of buildings in southern European countries, the materials, execution and quality requirements, the suitability and sustainability of applications techniques for anomalies mitigation and the energy rehabilitation of buildings will be presented and showcased to the trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the thermal insulation types and insulation systems requirements
	K2. Have acquired a good knowledge of the available efficient insulation techniques/methods
Skills	S1. Be able to demonstrate and explain to others the appropriate available efficient insulation techniques / methods
	S2. Research and update on new tendencies in the efficient thermal insulation field
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the new technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to insulation	• What is insulation? • Benefits of insulation. • Priorities for insulation. • Key design considerations. • Insulation terminology. • Types of insulation. • Health, safety and fire prevention relevant regulations.
Walls insulation	• Requirements derived from the relevant standards and Building Codes. • Choosing insulation according to the type of walls • Insulation materials • Material selection criteria
Roof and ceiling insulation	• Choosing roof / ceiling insulation materials (according to the type of roof) • Material selection criteria • Moisture problems – condensation • Fire and other hazards in attics

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 2: Efficient windows

GENERAL DESCRIPTION

In this Unit the new energy efficient windows concepts and standards concerning efficient thermal insulation and acoustics, shading devices and ventilation, as well as glazing technical requirements and main constructive elements concerning glass assembly and energy labelling of windows will be presented and showcased to trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good knowledge of the efficient windows basic characteristics
	K2. Be well aware of the basic principles of efficient windows
Skills	S1. Be able to demonstrate and explain to others the efficient windows concepts
	S2. Research and update on new tendencies in the efficient windows field
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the new technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the energy efficient windows	• The energy balance of a window. • Determine the appropriate glazing solution for given window. • Assessment of the energy performance of window products. • Energy labelling of windows.
Glazing types and characteristics	• Multiple layers (use of two or more panes or films) • Low-conductance gas fills between the layers • Thermally improved edge spacers • Low-emittance coatings
Frame types and their characteristics	• Metal (aluminium) frames • Thermally broken metal frames • Non-metal frames (PVC, wooden, wooden with metal / vinyl cladding, fiberglass, hybrid) • Proper sizing of frames

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 3: Efficient lighting

GENERAL DESCRIPTION

The efficient lighting basic principles (i.e. lighting techniques and relevant lumino-technical parameters, available solutions and application of lighting materials, efficient lighting building legislation and mandatory regulations concerning artificial lighting, power density and enhancing consumption reduction, etc.) will be presented and showcased to trainees during this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good knowledge of the efficient lighting basic principles
Skills	S1. Be able to demonstrate and explain to others the efficient lighting principles
	S2. Research and update on new tendencies in the efficient lighting field
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the new technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Lighting principles and terms	• Light quantity and quality • Energy consumption • Light uses and systems • Lighting standards and codes
Lighting design	• Principles of lighting design • Lighting design aspirations and considerations • Calculation principles • Maintenance of the lighting system
Energy efficient lighting	• Energy efficient light bulbs • Energy efficient ballasts • Luminaires • Control mechanisms and other ways to save energy

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

MODULE 6: RENEWABLES

LEARNING UNITS

Unit 1: Micro-wind systems for building applications

Unit 2: Biomass for water and space heating

Unit 3: Emerging technologies

Unit 1: Micro-wind systems for building applications

GENERAL DESCRIPTION

The basic characteristics of micro-wind turbine systems for building self-production and self-consumption of electricity, the application range of micro-wind turbine systems, as well as the operation components, the design and installation issues, relevant legislation and safety rules for wind turbines, their service & maintenance aspects will be presented and showcased to the trainees in the frame of this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the micro-wind systems basic principles & key characteristics
Skills	S1. Be able to demonstrate and explain to others the micro-wind systems for building self-consumption basic characteristics
	S2. Research and update on new tendencies in the micro-wind systems field
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the new technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to wind energy	• Wind types and basic physics • Wind potential maps • Energy extraction from the wind • Variability of the wind (with height, in the space, with time) • Effect of turbulence • Technological development - Wind energy market (current situation / trends-prospects)
Wind turbine characteristics	• Operating principle • Types of wind turbines • Wind turbine parts • Technical characteristics • Design - Future developments • Connection to the grid
Wind installations with small wind turbines	• Technology applications • Design considerations • Financial sustainability • Institutional framework • Personal protective equipment (PPE) and rules.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 2: Biomass for water and space heating

GENERAL DESCRIPTION

The basic characteristics of the application range of solid biomass boilers for self-consumption hot water (boilers, heat recovery) and for space heating (radiant floor, wall convectors), the installation and operation of equipment, and maintenance of mechanical and electric components principles, as well as the relevant legislation for Safety & Health will be presented and analysed to the trainees during this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the basic characteristics of biomass systems used for water and space heating
	K2. Have acquired a good knowledge of the installation, operation and maintenance issues of interest for biomass systems
Skills	S1. Be able to demonstrate and explain to the others the basic characteristics of biomass systems used for water and space heating
	S2. Research and update on new tendencies in the use of biomass systems for water and space heating
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the new technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to heat production from biomass resources	• Historical uses of biomass resources • Biomass as a solar energy store • Types of biomass fuels: forestry and agricultural sources, crop wastes • Benefits of using biomass heating • Barriers to the growth of biomass
Fuel characteristics, supply and combustion	• Wood as fuel – Choosing the right fuel – Moisture content – Calorific value – Constituents of wood – Quality and standards – Fuel costs comparison • Combustion characteristics – The combustion process – Combustion efficiency – Combustion air and excess air ratio, lambda λ – Emissions – System efficiency
Biomass heating systems	• Technical overview – Biomass heating systems types (pellet, wood-chip, log boilers) • Determining system sizes • Hydraulic systems. • Fuel storage systems • Chimney requirements • Installation issues • Health, safety and fire prevention • Regulations and Standards • Operation and Maintenance (O&M)

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions

☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 3: Emerging technologies

GENERAL DESCRIPTION

The emerging technologies in the field of RES (for example, heat pumps for efficient heating and cooling, new solar technologies, shallow geothermal systems, district heating, smart grids, ice storage) and available solutions and applications in the buildings scale, as well as relevant incentive programs and legislation, will be presented and showcased to the trainees during this Unit of the "RES" Module.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the available emerging RES technologies that can be applied to buildings
	K2. Have acquired basic knowledge of the available emerging RES technologies key characteristics
Skills	S1. Be able to demonstrate and explain to others the emerging RES technologies key characteristics
	S2. Research and update on new tendencies in RES technologies used in buildings applications
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the new technologies applied to buildings
	C3. Raise awareness (own and among professionals) about the new technologies applied to buildings

OUTLINE OF UNIT CONTENTS

Contents	Description
Heat pumps for efficient heating and cooling	• Theory/design of heat pump applications • Technical details of the heat pump cycle • Types of heat pump systems (closed-loop, open loop, hybrid) • Costs of a heat pump system • Operating modes and control • Ground heat exchanger design • Use of geothermal heat pumps design and simulation tools
New solar technologies	• Advances in building-integrated solar components • Photovoltaic transparent glass – Solar windows • Solar panel positioning robots • Space-based solar power • Hybrid photovoltaic-thermal systems (PV/T) • Advances in solar water heating (SWH) systems for both hot water production and space heating applications
Storage of RES produced energy	• Fuel cells • Lithium-air batteries • Hydrogen energy storage • Thermal storage (ice storage)
Developments in the distribution of the produced energy	• District heating/cooling – Key components of a district heating scheme – Supply by a diverse range of sources – Balance of the supply and generation of heat • Smart grids – First-generation smart grid – Distributed generation – Smart energy network

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

MODULE 7: LIFE CYCLE

LEARNING UNITS

Unit 1: Life Cycle perspective

Unit 2: Life Cycle costs

Unit 3: Integration of sustainability criteria in the design process

Unit 1: Life Cycle perspective

GENERAL DESCRIPTION

In this Unit the trainees will learn about the main characteristics of the Life Cycle of a sustainable construction (building), i.e. from the extraction of materials until the end of life of the construction, and more specifically what is a Life Cycle Assessment (LCA), its main stages, as well as what information is needed to perform a LCA of a building (it is not intended the trainees to learn how to perform a LCA, but need to understand what is necessary to perform a LCA and how LCA results can be used).

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Fully understand the Life Cycle Assessment (LCA) process and its main stages
	K2. Be well aware of what information is needed to perform a LCA
	K3. Have acquired a good knowledge of how the results of the LCA can be used
Skills	S1. Be able to demonstrate and explain to others the main characteristics of the life cycle of a building
	S2. Apply the Life Cycle Assessment (LCA) process to construction cases
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the LCA process as applied to buildings
	C3. Raise awareness (own and among professionals) about the life cycle perspective

OUTLINE OF UNIT CONTENTS

Contents	Description
Basics of Life Cycle perspective	• The life-cycle philosophy. • Important concepts in quantifying the environmental impact of buildings and the products comprising them. • The life-cycle stages of buildings. • Life Cycle Assessment (LCA) as a tool to evaluate environmental impacts.
Life cycle of materials	• Life cycle perspective of building elements / materials • Fundamental environmental issues that relate to basic building materials. • Economic and social considerations that need to be made for the selection of sustainable materials for buildings.
Life-Cycle Assessment(LCA)	• LCA as a tool for the quantitative assessment of a material used, energy flows and environmental impacts of products • The four stages of LCA methodological framework • Use of sustainability metrics in LCA • Selection of materials using the LCA method

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 2: Life cycle costs

GENERAL DESCRIPTION

The costs that occur in the Life Cycle of a construction / building (including acquisition, maintenance and end of life costs), together with the available systems of economic incentives for efficient energy and renewable energy sources, will be presented and showcased to the trainees during this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of the costs of sustainable constructions in their Life Cycle
	K2. Have acquired a good knowledge of how to handle the costs that occur in the Life Cycle of a construction
Skills	S1. Be able to demonstrate and explain to others the Life Cycle costs (LCCs) of constructions
	S2. Research and update on the LCCs of sustainable constructions
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the LCC concept as applied to buildings
	C3. Raise awareness (own and among professionals) about the life cycle perspective

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the Life Cycle Costing (LCC)	• What is Life Cycle Costing (LCC) and the benefits of using it. • How the LCC methodology supports sustainability. • The application of LCC to build environment decision-making
Description of the LCC method	• Building-related costs that need to be taken into account: – Initial costs — Purchase, acquisition, construction costs – Fuel costs (energy & water costs) – Operation, maintenance, and repair costs – Replacement costs – Residual values — Resale or salvage values or disposal costs – Finance charges — Loan interest payments – Non-monetary benefits or costs • Schemes of economic incentives for efficient energy use and renewable energy sources • Parameters for present-value analysis • Life-cycle cost calculation and evaluation criteria • Uncertainty assessment in LCC analysis
Examples of use of LCC	Examples of case studies analysed through the use of LCC analysis

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

Unit 3: Integration of sustainability criteria in the design process

GENERAL DESCRIPTION

In this Unit the trainees will learn how to integrate the environment and energy efficiency related, or, in other words, those related to "sustainability", criteria in the design process of the constructions, in conjunction with relevant stakeholders in the construction process (the client, architect, other designers and consultants, and possibly also future occupants), according to the purpose of the building.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good knowledge of how to integrate the environmental / sustainability criteria in the design process
Skills	S1. Be able to demonstrate and explain to others the environmental/sustainability criteria applied in the design process
	S2. Apply the integration of environment and energy efficiency related criteria in the design process
Competences	C1. Improve his/her technical abilities
	C2. Help professionals to understand the sustainability criteria as applied in the design process
	C3. Raise awareness (own and among professionals) about the sustainability criteria in the design process

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the sustainability in the design process of buildings	• Environmental sustainability (ability of the environment to support a defined level of environmental quality and natural resource extraction rates indefinitely). • Social sustainability (ability of a social system to function at a defined level of social wellbeing and harmony indefinitely). • Economic sustainability (ability of an economy to support a defined level of economic production indefinitely).
Environmental sustainability	• Indicators (core and additional) that need to be identified and selected
Social sustainability	• Indicators (core and additional) that need to be identified and selected
Economic sustainability	• Indicators (core and additional) that need to be identified and selected
Design-assisting tools that facilitate the integration of sustainability in the design process	• Non-interactive tools (sustainable design guidelines, checklists and element catalogues) • Analysis tools - computer-based (e.g. building performance simulation programs) or physical tools (e.g. artificial sky) • Methods of environmental assessment - classified in two groups: quantitative and qualitative methods

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☐ project
☐ written exercises / test

MODULE 8: PEDAGOGY

LEARNING UNITS

Unit 1: Communication strategies

Unit 2: Motivation strategies

Unit 3: Conflict resolution and mediation

Unit 4: Problem solving

Unit 5: Practice training

Unit 6: Use of communication devices

Unit 7: Self-improvement

Unit 8: Assertiveness

Unit 1: Communication strategies

GENERAL DESCRIPTION

The communication strategies that can be applied during the teaching procedure will be presented to the trainees in this Unit of Module 8.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of how to communicate better with students/other professionals
	K2. Have acquired good knowledge of the available communication strategies
Skills	S1. Be able to communicate better with his/her students and other professionals
	S2. Be able to transfer his/her knowledge to the students more effectively
Competences	C1. Organize his/her work better
	C2. Communicate more effectively with other professionals (including trainees)

OUTLINE OF UNIT CONTENTS

Contents	Description
Communication principles	• Terminology and usefulness. • Ways to communicate effectively with your team. • Steps for effective communication in the workplace: – Develop a communication strategy – Create a communication process – Multiply the message – Explain the why – Create feedback process
Types of communication strategies	• Verbal communication strategies can be broken down into the two categories of written and oral communication. • Nonverbal communication strategies consist of mostly visual cues, such as body language, facial expressions, physical distance between communicators, or the tone of voice. • Visual communication strategies (used in the workplace to draw attention and provide documentation) can be seen through signs, webpages, and illustrations.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☑ project
☐ written exercises / test

Unit 2: Motivation strategies

GENERAL DESCRIPTION

A great indication of a successful manager is one who has employees who are motivated to perform their jobs at a high level. The most well-known and widely applicable motivation strategies used to improve the employees/students' motivation are going to be presented and showcased to the trainees in this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of how to improve the employees/students' motivation
	K2. Have acquired good knowledge of the applicable motivation strategies
Skills	S1. Be able to improve an employee's and/or student's motivation
	S2. Be able to increase the performance of employees/students
Competences	C1. Organize his/her work better
	C2. Increase the performance of other professionals

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the need of employee motivation	• Empowerment occurs when individuals in an organization are given autonomy, authority, trust, and encouragement to accomplish a task. • Intrapreneurship encourages employees to pursue new ideas and gives them the authority to promote those ideas.
Providing an effective reward system	• Types of rewards: – Extrinsic rewards are externally administered. They are valued outcomes given to someone by another person, typically a supervisor or higher level manager. – Intrinsic rewards are self-administered (the motivational stimulus is internal and doesn't depend on the actions of other people). • Elements of an effective reward system.
Redesigning jobs	Redesign attempts may include the following: • Job enlargement, which increases the variety of tasks a job includes. • Job rotation that assigns people to different jobs or tasks to different people on a temporary basis. • Job enrichment, which provides an employee with more responsibility and authority.
Creating flexibility	• Flextime, which permits employees to set and control their own work hours, is one way that organizations are accommodating their employees' needs. • Other options organizations are trying: – A compressed workweek, i.e. a form of flextime that allows a full-time job to be completed in less than the standard 40-hour, five-day workweek. – Job sharing or twinning occurs when one full-time job is split between two or more persons. – Telecommuting, also called *flexiplace,* i.e. a work arrangement that allows at least a portion of scheduled work hours to be completed outside of the office, with work-at-home as one of the options.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☑ project
☐ written exercises / test

Unit 3: Conflict resolution and mediation

GENERAL DESCRIPTION

The principles of conflict resolution and mediation will be presented to the trainees in the frame of this Unit of the "Pedagogy" Module.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired a good knowledge of the basic principles of conflict resolution and mediation
	K2. Be well aware of how to effect the conflict resolution and mediation
Skills	S1. Be able to resolve any problem that may arise in intra-job relationships
	S2. Be able to act as mediator for the resolution of conflicts
Competences	C1. Organize his/her work better
	C2. Collaborate more effectively with other professionals

OUTLINE OF UNIT CONTENTS

Contents	Description
Basics of conflict resolution	• Types of conflict. • Essential skills for handling conflict. • Strategies for dealing with conflict: – Compete or fight – Collaboration – Compromise or negotiation – Denial or avoidance – Smoothing over the problem • Mediation in practice
Negotiation	• Overview of theories and models, establishing key principles for effective negotiation. • Practical negotiation exercises to build knowledge and skills, covering such topics as business contracts, the public sector and personal injury.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises

☑ project
☐ written exercises / test

Unit 4: Problem solving

GENERAL DESCRIPTION

The problem solving (when working with operational difficulties) strategies and techniques that work will be presented and showcased to the trainees in the frame of this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired good knowledge of the problem solving strategies that work
	K2. Be well aware of how to apply the problem solving strategies
Skills	S1. Be able to identify and solve problems
	S2. Be creative when offering solutions
Competences	C1. Organize his/her work better
	C2. Communicate more effectively with other professionals

OUTLINE OF UNIT CONTENTS

Contents	Description
Problem solving basics	• What is problem-solving? • Basic steps in solving a problem: – Defining the problem. – Generating alternatives. – Evaluating and selecting alternatives. – Implementing solutions. • Skills needed for problem solving.
Problem-solving stages	• Evaluating the problem • Managing the problem • Decision-making • Resolving the problem • Examining the results
Problem-solving plan	Exercise: Creating problem solving plans

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☑ project
☐ written exercises / test

Unit 5: Practice training

GENERAL DESCRIPTION

In Unit 5 of the *Pedagogy* Module, the basic principles of how to practice training, in other words 'how to apply theory to practice', will be presented and showcased to the trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired basic knowledge of how to apply theory to practice
	K2. Be well aware of the basic principles of practice training
Skills	S1. Be able to apply the theoretical knowledge to practice
	S2. Be able to transfer his/her knowledge to the students more effectively (through practice)
Competences	C1. Improve a team of professionals performance
	C2. Enhance or refine a newly acquired skill

OUTLINE OF UNIT CONTENTS

Contents	Description
Principles of practicing	• The difference between practice and training • The value of exercise • Encouragement of active learning through practice
Principles of improving teaching through practice	• Push beyond one's comfort zone • Work towards well-defined, specific goals • Focus intently on practice activities • Receive and respond to high-quality feedback • Develop a mental model of expertise

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:

☑ examination
☐ oral examination / exercises
☑ project
☐ written exercises / test

Unit 6: Use of communication devices

GENERAL DESCRIPTION

The use of communications devices (for example, cellular phones, computer and network hardware and software, video-conferencing and distance learning) to the benefit of the educational process will be presented and showcased to the trainees in this Unit.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of how to communicate better with his/her students using the appropriate communications devices
	K2. Have acquired basic knowledge of the available communication devices that can be used for educational purposes
Skills	S1. Be able to communicate better and more effectively with his/her students and other professionals
Competences	C1. Organize his/her work better
	C2. Communicate more effectively with other professionals

OUTLINE OF UNIT CONTENTS

Contents	Description
Introduction to the use of communication devices in training	• What are the gainings for learners and teachers/trainers through the use of communication devices? • How to use communication devices in the vocational and job oriented areas of general education. • Choosing the right device: – Portable or mounted? – Symbols or text? – Synthetic or digitised (recorded) speech? – Dedicated or computer based?

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☑ project
☐ written exercises / test

Unit 7: Self-improvement

GENERAL DESCRIPTION

In this Unit of the *Pedagogy* Module, the ways of self-improvement (i.e. new pedagogic methodologies, professional activities, new trends, information, knowledge, etc.) will be presented to the trainees.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Be well aware of how to improve himself/herself to perform more effectively the teaching
Skills	S1. Be able to evolve himself/herself to the benefit of the educational process
	S2. Identify the most appropriate tools and techniques that will facilitate his/her self-improvement
Competences	C1. Organize his/her work and teaching better
	C2. Communicate more effectively with other professionals and the students

OUTLINE OF UNIT CONTENTS

Contents	Description
Routes to personal development	• Earning an advanced degree in an area within education is a fantastic way to gain a fresh perspective. • Advice/evaluations from administrators. • Experience is perhaps the greatest teacher. • Journaling can provide valuable learning opportunities through self-reflection. • Literature • Mentoring can be an invaluable tool for professional growth and development. • Participation in professional development workshops / conferences • Social media and the Internet • Teacher-teacher observations.
Improving the way of teaching	• Addition of new teaching strategies: – concept attainment, – reciprocal learning, – the Jigsaw strategy • Learning more about learning. • Improving the way to differentiate instruction.
Get organized	• Organization of time, • Organization of digital files, • Organization of projects, • Getting the classroom in order.

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☑ project
☐ written exercises / test

Unit 8: Assertiveness

GENERAL DESCRIPTION

In this Unit the trainees will be taught about the strategies of assertiveness, or – in other words – on how to react confidently and quickly in situations that require the management of student behaviour.

LEARNING OUTCOMES

On successful completion of the Unit, the trainee should:

Knowledge	K1. Have acquired basic knowledge of the available ways to become more assertive
	K2. Be well aware of how to manage the behaviour of his/her students
Skills	S1. Be able to create challenges to his/her students
	S2. Be able to provide any kind of support needed to the students (afterwards)
Competences	C1. Improve students' performance
	C2. Communicate more effectively with the students

OUTLINE OF UNIT CONTENTS

Contents	Description
Assertiveness principles	• Assertive behaviour characteristics • Results of assertive behaviour • The benefits of being assertive • Assertive discipline techniques
Ways that teachers can become more assertive	• Meet and greet • Clarifying expectations • Start with a strong plan • Positioning yourself in the class • Eye contact • None verbal reminders • Challenge students one at a time • Ask questions rather than give instructions • Visual aids, wall charts and interactive whiteboard tools
Developing assertiveness skills	• Value yourself and your rights • Voice your needs and wants confidently • Acknowledge that you can't control other people's behaviour • Express yourself in a positive way • Be open to criticism and compliments • Learn to say "No" • Use assertive communication techniques

DELIVERING AND ASSESSMENT

The unit will be delivered through:
☑ discussions
☐ hands-on
☑ lessons
☑ role-play

The unit will be assessed through:
☑ examination
☐ oral examination / exercises
☑ project
☐ written exercises / test

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