VENUS
WOOD EDUCATION
FOR SUSTAINABLE CONSTRUCTION

Joint Curriculum and Methodology

Co-funded by
the European Union

WENUS Joint Curriculum

Wood and timber construction for the future

February 2025

Co-funded by the European Union

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Wenus project

The WENUS project focuses on improving vocational education and training (VET) in the wood and timber construction sector through the integration of circular economy (CE) principles and 3D printing technologies. The initiative responds to the growing need for green and digital skills, ensuring that students are equipped with the skills needed to contribute to a more sustainable and innovative construction industry.

To achieve this, the project focuses on creating a student-centred curriculum that integrates CE principles with practical training exercises in 3D printing. An e-learning platform will be launched to broaden access and enrich vocational training, equipping learners with essential green and digital competencies to drive greater sustainability and innovation within the sector. Additionally, a comprehensive guide for trainers will be developed, accompanied by widespread dissemination activities to maximize impact.

This document provides a comprehensive overview of the WENUS training course, including its curriculum, pedagogical approach, and training methodologies. These resources aim to strengthen professional training in sustainable timber construction and related materials, supporting the transition toward a more circular and responsible sector.

Furthermore, the Methodological Guide for Teachers is included, which will also serve as the foundation for the Trainer's Guide in WP3. This resource will provide a holistic and practical tool for vocational training in sustainable timber and wood-based construction.

With the completion of this work package (WP2) *"WENUS Joint Curriculum",* the project reaches milestone one *"A detailed curriculum for sustainable wood and timber construction, covering educational objectives, curriculum design, and teaching methodologies, finalised with external evaluation and approval."*

For more information, visit: https://wenusproject.eu

Joint curriculum structure

The WENUS Joint Curriculum has been developed to modernize VET in the wood and timber construction sector. It equips learners with essential green and digital skills, addressing the industry's evolving needs for sustainability, efficiency, and innovation. Grounded in circular economy (CE) principles, the curriculum integrates 3D printing technologies and Industry 4.0 tools, offering a blend of practical and theoretical knowledge to prepare learners for a more environmentally responsible and technologically advanced construction sector.

Designed as a modular learning framework, the curriculum is structured to target key competencies in sustainability and digitalisation. Each of its four modules focuses on critical areas such as CE principles, innovative materials, digital tools, and future trends, ensuring a comprehensive and flexible learning experience for students, educators, and industry professionals. The incorporation of a student-centred approach and the use of an e-Learning platform further enhance accessibility and the relevance of training content.

The learning outcomes defined in the curriculum align with the broader objectives of the WENUS project, ensuring that learners gain a solid understanding of the environmental, technological, and economic dimensions of sustainable timber construction. These outcomes are designed to equip participants with future-oriented skills, enabling them to effectively apply CE principles, innovative technologies, and sustainable practices in real-world construction scenarios.

Furthermore, the curriculum supports European priorities such as The European Green Deal[1] and Sustainable Development Goals[2] (SDGs) by promoting knowledge and competencies that contribute to reducing the environmental impact of construction, improving resource efficiency, and fostering innovation. Through its modular structure and interactive training methodologies, the WENUS JC empowers learners to excel in the green and digital transition, positioning them as key contributors to the future of sustainable construction.

[1] The European Green Deal. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

[2] Sustainable Development Goals. https://sdgs.un.org/goals

As part of the WENUS project, the development of the Educational Framework[3] marked the identification of 20 learning outcomes and 10 objectives to guide the JC. In this subsequent phase, four additional learning outcomes focusing on soft skills have been incorporated to align the curriculum with the principles of Education 4.0, enhancing its relevance and future orientation. These learning outcomes and objectives have been structured into four training modules, encompassing a total of 15 learning units, carefully designed to address the gaps identified in the Educational Framework while advancing the project's overarching goals.

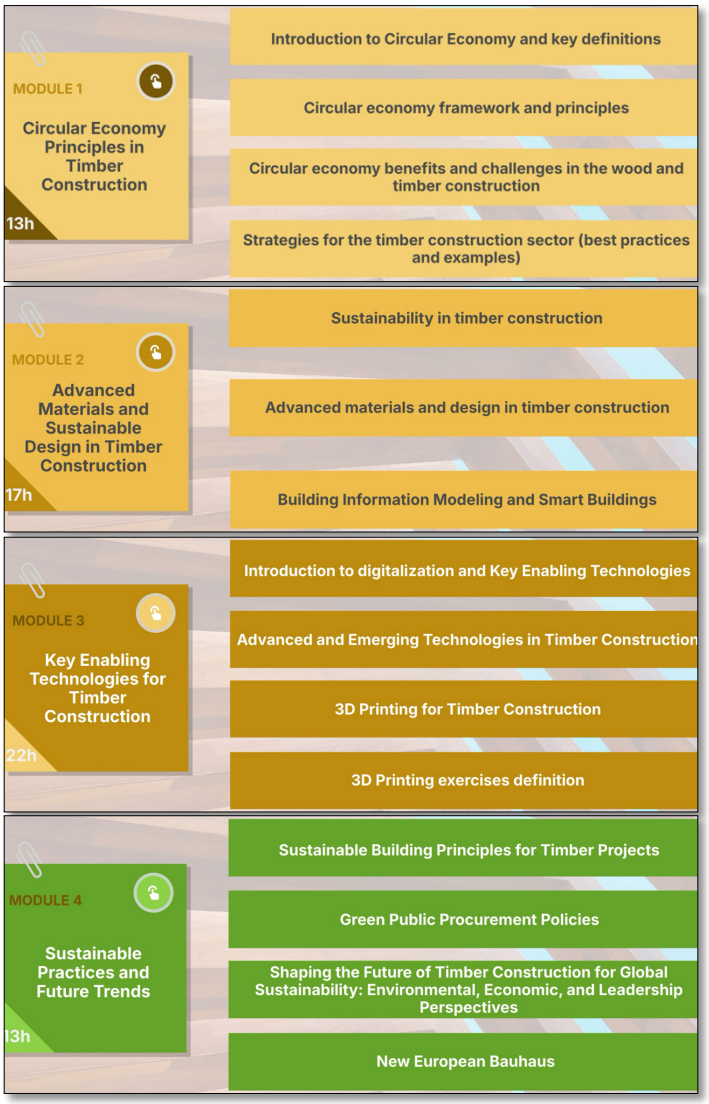


Figure 1: WENUS Project Modules and Learning Units.

WENUS JC Infographic:

https://view.genially.com/679a1341807e2af4872d99eb/interactive-content-wenus-joint-curriculum

[3] WENUS Educational Framework. https://wenusproject.eu/wp-content/uploads/2024/12/WENUS_Detailed-Educational-Framework-2.pdf

Alignment Matrix of Objectives, Learning Outcomes, and Learning Units

The Alignment Matrix of Objectives, Learning Outcomes, and Learning Units (Table 1) provides a structured overview of the relationships between the educational objectives, learning outcomes, and learning units within the WENUS Joint Curriculum. This matrix is designed to map how each learning unit contributes to achieving specific objectives and outcomes, ensuring a comprehensive and cohesive approach to curriculum implementation.

- Rows: Represent the learning outcomes and objectives identified for the curriculum, providing clarity on the expected skills and competencies to be achieved.
- Columns: Correspond to individual learning units, detailing the specific topics or training activities covered within the curriculum.
- Matrix Content: Marks or indicators in the cells highlight the alignment, showing which learning units address each objective and outcome.

This alignment matrix serves as a practical tool for curriculum developers, educators, and stakeholders, enabling them to:

- Visualize the integration of learning outcomes and objectives into the training structure.
- Ensure all educational objectives are addressed effectively within the curriculum.
- Identify how specific learning units contribute to achieving desired competencies.

Mapping these elements, the matrix also serves as a flexible tool for adaptation, enabling educators to tailor the curriculum to specific regional or institutional needs, while maintaining consistency with the standards of the European Qualifications Framework (EQF). Furthermore, it provides a structured pathway for learners to develop future-oriented skills in sustainable timber construction, ensuring that vocational training remains aligned with industry needs and technological advances.

Table 1: Alignment Matrix of Objectives, Learning Outcomes, and Learning Units.

ID	Alignment Matrix of Objectives, Learning Outcomes, and Learning Units	M1: Circular Economy Principles in Timber Construction				M2: Advanced Materials and Sustainable Design in Timber Construction			M3: Industry 4.0 Technologies for Timber Construction				M4: Sustainable Practices and Future Trends			
		Introduction to Circular Economy and key definition	Circular economy framework and principles	Circular economy benefits and challenges in the wood and timber construction	Strategies for the timber construction sector (best practices and examples)	Sustainability in timber construction	Advanced materials and design in timber construction	Building Information Modeling and Smart Buildings	Introduction to digitalization and Key Enabling Technologies	Advanced and Emerging Technologies in Timber Construction	3D Printing for Timber Construction	3D Printing exercises definition	Sustainable Building Principles for Timber Projects	Green Public Procurement Policies	Shaping the Future of Timber Construction for Global Sustainability: Environmental,	New European Bauhaus
1	Explain the basic principles of Circular Economy (CE) and their application in timber construction.	✓	✓	✓												
2	Identify the cascading use of materials in timber construction to enhance sustainability.						✓									
3	Describe sustainable sourcing practices for timber and other construction materials.				✓		✓									
4	Assess strategies for reducing waste and improving material efficiency in timber construction.				✓		✓									
5	Recognize the environmental benefits of using advanced timber materials such as cross-laminated timber (CLT).						✓									
6	Explain the concept of carbon footprint and its relevance to timber products.					✓										
7	Recommend basic material choices aligned with sustainability goals in timber construction.						✓									
8	Outline the lifecycle of timber construction materials and identify key stages for reducing environmental impacts.					✓										
9	Describe how automation technologies can improve timber construction processes.									✓						
10	Explain the role of 3D printing and other advanced digital tools in timber construction.									✓	✓					
11	Understand basic approaches to solving challenges related to sustainability in timber construction.												✓			
12	Describe key developments in sustainable timber construction, including the use of innovative materials and low-carbon techniques.						✓									
13	Analyze the advantages of timber construction for achieving environmental and economic sustainability.						✓	✓								
14	Interpret basic green public procurement policies and their application in timber construction projects.													✓		
15	Describe the principles of green building practices and their integration into timber projects.												✓			
16	List the main challenges in the timber industry and propose basic strategies to address them using CE concepts.												✓			✓
17	Understand the role of Industry 4.0 technologies in modernizing timber construction processes.									✓						
18	Evaluate simple examples of lifecycle assessment (LCA) in timber construction to assess environmental impacts.					✓										
19	Recognize the importance of sustainable material sourcing strategies in the context of CE principles.				✓											
20	Explain the connection between timber construction and global sustainability goals, such as SDGs 9 and 13.														✓	
	Learning Outcomes Soft Skills															
21	Demonstrate teamwork and problem-solving skills to address challenges in implementing Circular Economy (CE) principles in timber construction.				✓											
22	Apply critical thinking and collaboration techniques to propose innovative solutions for sustainability challenges in timber construction.					✓										
23	Develop adaptability and resilience to effectively integrate and utilize digital tools and Industry 4.0 technologies in timber construction projects.									✓	✓	✓				
24	Exhibit leadership and decision-making abilities to manage and guide sustainable timber construction initiatives.														✓	
ID	Objectives															
1	Understand the principles of Circular Economy (CE)	✓	✓	✓	✓											
2	Enhance knowledge of digital tools								✓	✓	✓	✓				
3	Strengthen understanding of advanced materials						✓									
4	Encourage sustainable design thinking							✓								
5	Build awareness of lifecycle assessments (LCA)					✓										
6	Promote green skills	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓
7	Foster understanding of Industry 4.0								✓	✓						
8	Explore future trends in timber construction														✓	
9	Integrate green public procurement knowledge													✓		
10	Connect timber construction with global sustainability goals														✓	✓

The table below presents the four modules, their corresponding component units, and the allocated time in hours for each module:

Table 2: WENUS Joint Curriculum Structure.

WENUS Joint Curriculum Structure		Pedagogical Approach	Materials	EQF/NQF	Reading Hours	Self learning (H)	Infographic	Videos (H)	Assessment (H)	ToTal Hours	ECVET
MODULE 1	**Circular Economy Principles in Timber Construction**	Multiple choice / True or False	Coursebook / Videos / Infographic	**4**	6	6	0,5	0,1	0,5	13,10	0,524
LU1	Introduction to Circular Economy and key definition										
LU2	Circular economy framework and principles										
LU3	Circular economy benefits and challenges in the wood and timber construction										
LU4	Strategies for the timber construction sector (best practices and examples)										
MODULE 2	**Advanced Materials and Sustainable Design in Timber Construction**	Multiple choice / True or False	Coursebook / Videos / Infographic	**4**	8	8	0,5	0,1	0,5	17,10	0,684
LU5	Sustainability in timber construction										
LU6	Advanced materials and design in timber construction										
LU7	Building Information Modeling and Smart Buildings										
MODULE 3	**Key Enabling Technologies for Timber Construction**	Multiple choice / True or False	Coursebook / Videos / Infographic / 3D models	**4**	10	10	0,7	0,5	0,5	21,70	0,868
LU8	Introduction to digitalization and Key Enabling Technologies										
LU9	Advanced and Emerging Technologies in Timber Construction										
LU10	3D Printing for Timber Construction										
LU11	3D Printing exercises definition										
MODULE 4	**Sustainable Practices and Future Trends**	Multiple choice / True or False	Coursebook / Videos / Infographic	**4**	6	6	0,5	0,1	0,5	13,10	0,524
LU12	Sustainable Building Principles for Timber Projects										
LU13	Green Public Procurement Policies										
LU14	Shaping the Future of Timber Construction for Global Sustainability: Environmental, Economic, and Leadership Perspectives										
LU15	New European Bauhaus										
										65,00	**2,6**

Alignment of National Qualification Frameworks (NQFs) with the European Qualifications Framework (EQF) – WENUS Joint Curriculum

The WENUS Joint Curriculum has been aligned with Level 4 of the European Qualifications Framework to ensure its compatibility with national education and training systems and to facilitate the recognition of qualifications across Germany, Poland, Slovenia, and Spain. The selection of EQF Level 4 is based on the competencies and learning outcomes targeted in the curriculum, which correspond to the knowledge, skills, and responsibilities defined for this level in the EQF. This alignment ensures that learners acquire both theoretical understanding and practical skills relevant to the timber construction sector, preparing them for real-world applications and industry demands.

At EQF Level 4, individuals are expected to possess:

- A broad range of theoretical and practical knowledge in a field of work or study, allowing them to understand and apply fundamental concepts in a structured way.
- A set of cognitive and technical skills enabling problem-solving, evaluation, and adaptation to predictable work or learning environments.
- Competences related to autonomy and responsibility, including the ability to supervise routine tasks, apply sustainable construction practices, and work independently or in teams.

Key Considerations for the EQF Level 4 Alignment in WENUS

To ensure a precise alignment between the WENUS curriculum and the NQFs in the participating countries, the following aspects have been carefully integrated:

- Competency Mapping: The learning outcomes have been structured to match technical knowledge, sustainability skills, and digital competencies expected at Level 4 of each national qualification framework. The curriculum ensures that learners develop a strong foundation in circular economy principles, 3D printing technologies, and sustainable design for timber construction, which aligns with industry and educational standards at this level.

- Balance Between Theoretical and Practical Knowledge: The curriculum integrates structured theoretical content with practical applications, including case studies, industry-based scenarios, and digital modelling exercises. This combination ensures that learners not only understand key concepts but also apply them in real-world timber construction contexts.
- Development of Applied Technical Skills: Learners will acquire cognitive and practical skills that enable them to solve industry-specific challenges, such as material efficiency analysis, digital fabrication, and sustainable timber management. These skills align with EQF Level 4 expectations, where individuals are trained to work autonomously and adapt to sectoral technological advancements.
- Emphasis on Autonomy and Responsibility: The curriculum prepares learners to carry out tasks independently, make informed decisions, and supervise work processes in timber construction and digital fabrication. As required at EQF Level 4, participants will assume responsibility for the quality of their work, ensure compliance with sustainability standards, and adapt to evolving industry technologies.
- Soft Skills Integration: In line with Education 4.0 principles, the curriculum includes leadership, teamwork, and decision-making components, ensuring that learners are prepared for collaborative and digitalised work environments. These competencies enhance adaptability to industry shifts and foster professional growth in a rapidly evolving sector.
- Facilitation of International Recognition and Mobility: Assigning EQF Level 4 to the WENUS curriculum ensures compatibility with European qualification systems, allowing learners to validate their skills across different countries and facilitate their integration into the international labour market.

To confirm the WENUS JC aligns with EQF Level 4, a comparative analysis has been conducted to ensure it meets the required knowledge, skills, and competences. This includes evaluating the WENUS training program and its alignment with National Qualification Frameworks (NQFs) in Germany (DQR), Poland (PRK), Slovenia (SQF), and Spain (MECU).

The analysis first defines the WENUS qualification framework, outlining the knowledge, skills, and competences learners will develop, ensuring compliance with EQF Level 4 descriptors. It

then examines how this level corresponds to national qualifications in the partner countries, identifying common learning outcomes and professional competencies.

This approach confirms that the WENUS curriculum is recognised, applicable, and transferable across European vocational training systems, reinforcing its relevance in the timber construction sector and supporting qualification recognition and mobility within the European VET system.

Table 3: Qualification, knowledge, skills, and competences gained through the WENUS training course, ensuring compliance with EQF Level 4 descriptors.

	WENUS Project - EQF Level 4
Qualification	Certificate of completion of the WENUS training course in sustainable timber construction, integrating circular economy principles, Industry 4.0 concepts, and basic digital competencies. Equivalent to EQF Level 4.
Knowledge	Understanding of circular economy principles and their application in timber construction. Awareness of sustainable materials and practices. Basic knowledge of key enabling technologies in the sector, including an introduction to 3D printing for construction. Familiarity with sustainable policies, such as Green Public Procurement (GPP) and European sustainability goals.
Skills	Ability to apply circular economy strategies to improve resource efficiency in timber construction. Capability to analyse the environmental impact of construction materials. Basic understanding of how digitalization influences sustainable construction, including the role of automation and prefabrication. Problem-solving skills for addressing sustainability challenges in the sector.
Competences	Work independently within structured guidelines, applying sustainability principles to timber construction processes. Collaborate effectively in discussions about circular economy implementation. Demonstrate adaptability in learning new sustainability-driven methodologies. Take responsibility for applying best practices in timber construction, particularly in optimizing material use and reducing environmental impact.

Table 4: EQF Level 4 Equivalence Across National Qualification Frameworks.

	EQF Level 4	DQR (Germany)	PRK (Poland)	SQF (Slovenia)	MECU (Spain)
Qualification	Recognized diploma or certificate at EQF Level 4.	Berufsfachschule (Vocational Training)	Matura (Secondary School Diploma) - A diploma confirming vocational qualifications upon graduation from a technical secondary school or post-secondary school. - and after passing examinations confirming qualifications in a given profession. - A vocational diploma: upon graduation from a technical secondary school.	Upper Secondary Vocational Diploma (Level 4 SQF).	4A Técnico de Formación Profesional (Vocational Training Technician). 4B Certificado de Profesionalidad Nivel 2 (Level 2 Professional Certificate).
Knowledge	Factual and theoretical knowledge in broad contexts within a field of work or study	Be in possession of deeper general knowledge or theoretical professional knowledge within a field of study or field of occupational activity.	Possession of deeper general knowledge or theoretical professional knowledge within a field of study or occupational activity.	Predominantly vocational knowledge supplemented by knowledge of theoretical principles, particularly those from the relevant discipline. The study of examples and the integration and application of knowledge take precedence over the principles of systematic scientific organisation.	Specialised knowledge of facts, principles, processes, and concepts within broad contexts in the professional, academic, or training domain.

Skills	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Be in possession of a broad spectrum of cognitive and practical skills which facilitate autonomous preparation of tasks and problem solving and the assessment of work results and processes according to consideration to alternative courses of action and reciprocal effects with neighbouring areas. Provide transfers of methods and solutions.	Possession of a broad spectrum of cognitive and practical skills that facilitate the autonomous preparation of tasks, problem-solving, and the assessment of work results and processes, considering alternative courses of action and reciprocal effects with neighbouring areas. Provides transfers of methods and solutions.	Application of knowledge to resolve various tasks and problems, including less typical situations. Wide-ranging and specialised skills in relation to the area of operation, including the use of appropriate tools, methods, different technological procedures and materials. Ability to carry out relatively transparent, less standardised tasks.	Analyse and apply knowledge to solve defined problems in general or specialised contexts. Communicate effectively in moderately complex situations, conveying concrete and abstract ideas with varied resources. Conduct autonomous research and apply findings to specialised domains. Use information and communication technologies proficiently and responsibly.
Competences	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities	Be in possession of deeper general knowledge or theoretical professional knowledge within a field of study or field of occupational activity. Set own learning and work objectives, reflect on and assess such objectives and take responsibility for them.	Ability to set own learning and work objectives, reflect on and assess such objectives, and take responsibility for them.	Ability to operate in a familiar and less familiar setting with a greater degree of responsibility and autonomy. Taking responsibility for characteristics and quality of products/services connected with work tasks or processes. Taking responsibility for own learning. Acquisition of new knowledge and skills in a supervised environment. This level is characterised by a certain entrepreneurial orientation and the ability to organise and work in team	Supervise routine work, taking responsibility for evaluation and improvement. Assess the impact of actions in specific or moderately complex contexts. Innovate, take initiative, and manage risks in problem-solving and project management to achieve objectives. Cooperate and negotiate effectively in relevant academic, professional, or training situations.
Source	European Union. Description of the eight EQF levels. Europass.	German Qualifications Framework (DQR). Level 4 of the DQR.	Polish Ministry of Education. Polish Qualifications Framework (PRK) - Level 4.	Slovenian Qualifications Framework (SQF). Table of Qualifications - SQF Level 4.	Royal Decree 272/2022, of 12 April, establishing the Spanish Qualifications Framework for Lifelong Learning (BOE nº 109, 07/05/2022)

Use of ECVET points

In the Wenus project, the decision to focus on ECVET principles, particularly in defining learning outcomes and objectives for the joint curriculum, is a strategic response to the evolving needs of VET in Europe. Although the concept of ECVET points, initially envisioned as a cornerstone for a European credit system in vocational education, was not widely applied in practice, its intrinsic value aligns smoothly with the objectives of Wenus.

Incorporating ECVET principles, the Wenus curriculum offers flexibility and is outcome-oriented, tailored to the specific needs of VET learners. This ensures the recognition and validation of skills and competencies acquired, an aspect of vocational education. Moreover, adopting ECVET points enhances the mobility and lifelong learning of VET students. It allows for more flexible learning pathways, facilitating mobility and ongoing professional development, crucial for sectors undergoing digital and green transitions.

Furthermore, the adaptability of the ECVET points system enables to customise training programs to meet the specific needs of these transitions in both manufacturing and traditional sectors. This dynamic and responsive approach aligns vocational education with the evolving demands of the labour market, making the training more relevant and valuable for VET students.

Wenus Project ECVET points

The following key points have been taken into consideration in the process of defining the ECVET credit points for the Wenus training course:

- Project partners share the belief that ECVET points should be allocated to all units of learning outcomes within the qualification framework. Recording them in the personal transcript provides information about the scope of the learning outcomes achieved within the qualification.
- The successful acquisition of the whole qualification or its individual units of learning outcomes results in the awarding of the corresponding ECVET points, regardless of the time taken - whether it is formal training, non-formal training, or informal learning.

- Credit points can be utilized by trainees, individuals practicing a qualification without an official vocational qualification document, vocational education and training institutions, employers, and others to identify the individually acquired qualification.
- ECVET points support the trainee in acquiring the given qualification by mastering the units of learning outcomes that constitute it, in different countries and learning contexts (formal, non-formal, informal), while adhering to national legislation and complying with validation and recognition arrangements and regulations.

The total number of ECVET points is defined based on the duration of the training program in the formal education and training system. ECVET credits are transformed based on the assumption that 1 ECVET point equals one ECTS credit, and 1 ECTS credit equals 25 hours of total learning. This assumption is shared by the ECVET secretariat and most National Authorities. It aligns with the system used in ECTS and Higher Education Qualifications, enhancing comparability and potential permeability. However, the allocation of hours for study, self-learning, training videos watching, and self-assessment may vary due to the diverse areas, fields, and final targets covered by VET. Nevertheless, the quality assurance of the training materials and the endorsement of the JC will ensure the achievement of the expected results.

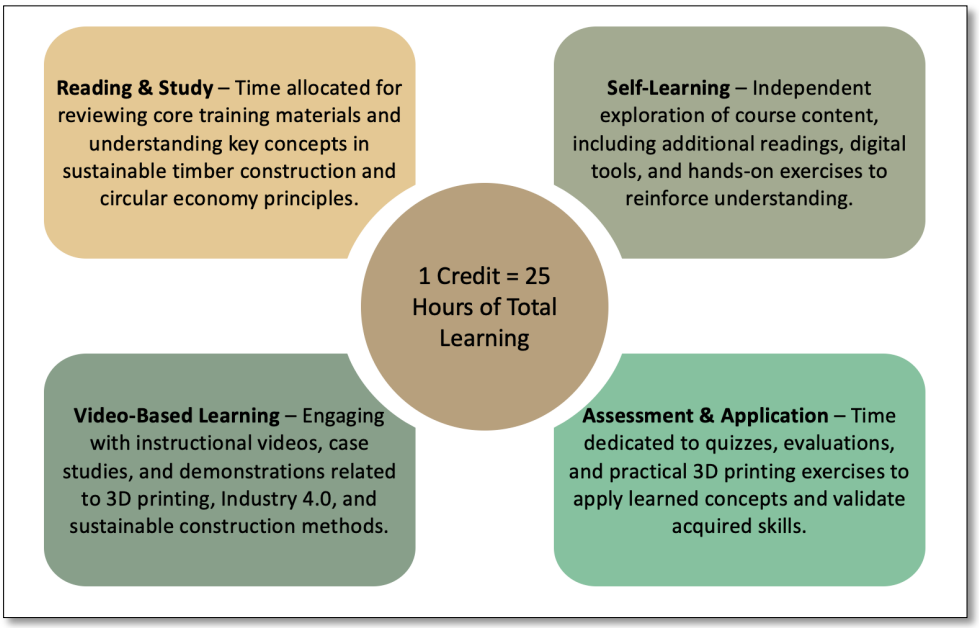


Figure 2: ECVET definition in hours.

Considering the relative weight or duration of each unit and module, it becomes possible to estimate the corresponding ECVET points for each of them.

WENUS PROJECT			
EQF / NQF Level - 4			
TRAINING MODULES	TRAINING LEARNING DURATION (HOURS)	RELATIVE WEIGHT IN THE FRAMES OF QUALIFICAION (%)	NUMBER OF ECVET POINTS
Circular Economy Principles in Timber Construction	13,10	20,2	0,52
Advanced Materials and Sustainable Design in Timber Construction	17,10	26,3	0,68
Industry 4.0 Technologies for Timber Construction	21,7	33,4	0,87
Sustainable Practices and Future Trends	13,10	20,2	0,52
TOTAL	65	100	2,6

Figure 3: Relative weight and number of ECVET points per module.

Pedagogical approach of Wenus – web-based training

The Wenus project embraces the **Web-Based Training (WBT)** model, a modern educational strategy that utilizes online resources to deliver training and development opportunities. The Web-Based Training (WBT) model presents a highly suitable approach for Vocational Education and Training (VET) learners and providers.

This suitability is grounded in several key aspects:

Firstly, WBT offers unparalleled accessibility and flexibility, allowing learners to access training materials at any time and from any location. This feature is especially beneficial for employees in SMEs who often have varying schedules and may find it challenging to participate in traditional, scheduled training sessions. The ability to access training asynchronously caters to the diverse needs of a modern workforce.

Secondly, the model excels in customization and relevance. Online training programs can be specifically tailored to meet the unique needs and challenges of the furniture and textile industries. This level of customization ensures that the training is not only relevant but also directly applicable to the learners' professional context, enhancing the practical value of the training experience.

Another significant advantage of WBT is the provision of up-to-date content. In industries like furniture and textile, which are rapidly evolving due to technological advancements, it's crucial to have access to the latest information and skills. WBT facilitates quick and easy updates of training materials, ensuring that learners are always equipped with current and industry-relevant knowledge.

Interactive learning experiences are a cornerstone of the WBT model. By incorporating elements such as simulations, videos, and quizzes, the training becomes more engaging and effective. These interactive components are particularly beneficial in demonstrating and teaching the practical skills required in the furniture and textile manufacturing sectors.

Scalability is another hallmark of WBT. The model can accommodate a large number of learners simultaneously, which is particularly advantageous for VET providers tasked with training numerous employees across various locations. This scalability ensures that quality training is delivered consistently and efficiently to a broad audience.

From a financial perspective, WBT offers cost-effectiveness, a crucial consideration for SMEs often operating under budget constraints. By reducing or eliminating the need for physical training materials, travel, and accommodation expenses typically associated with traditional training methods, WBT presents a more economically viable training solution.

Continuous learning and development are essential in industries experiencing constant technological and methodological advancements. WBT supports this need by facilitating ongoing learning opportunities, allowing for professional growth and development that keep pace with industry changes.

Lastly, WBT's ability to integrate with industry standards and trends ensures that the workforce is well-prepared to meet both current and future sector demands. This alignment with industry developments further reinforces the relevance and effectiveness of the training provided.

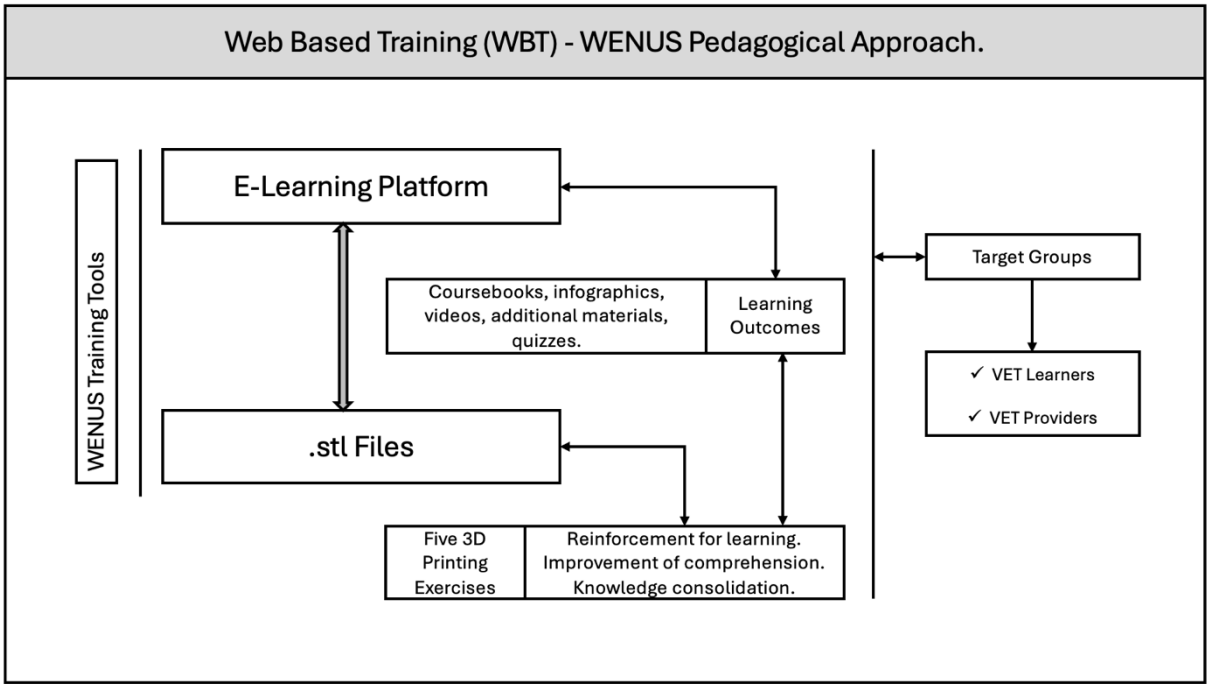


Figure 4: Wenus Pedagogical Approach.

Adopting an adapted pedagogical approach for online learning, the Wenus training course offers several advantages to Vocational Education and Training (VET) learners:

1. **Flexibility and Accessibility**: The online course provides learners with the flexibility to access materials at any time and from any location, which is essential for those balancing work or other commitments.
2. **Modular Online Structure**: Organized into distinct online modules and learning units, the course content focuses on specific aspects of the twin transition in the manufacturing sector, facilitating a structured and effective learning process.
3. **Self-Paced Learning**: This approach allows learners to progress at their own pace, spending more time on complex topics or moving swiftly through familiar content.
4. **Enhanced Language Skills**: As the course is developed in English, it provides an excellent opportunity for learners to improve their English language skills. This is especially valuable in the globalized business environment where English is often used as the common language.
5. **Wide Range of Digital Resources & Interactive Digital Content**: The use of various multimedia content, such as videos, infographics and the interactive tool, supports different learning styles and can make complex technical concepts more understandable.
6. **Immediate Feedback in Assessments**: Online quizzes offer immediate feedback, helping learners quickly gauge their understanding of the material and identify areas where they need more study.
7. **Gamification Elements for Engagement**: The inclusion of gamification elements makes the learning process more engaging and fun, which can be particularly effective for language learning.
8. **Scalability and Reach**: Online courses can accommodate a large number of learners simultaneously, making it easier to disseminate knowledge widely across different geographic locations.
9. **Resource Library in English**: A comprehensive online library with additional reading materials and relevant links in English further supports language learning.
10. **Cost-Effectiveness**: By reducing the need for physical materials, travel, and accommodation, online learning can be more cost-effective for both learners and training providers.

11. **Tracking and Monitoring of Progress**: E-learning platforms enable the tracking of learners' progress, allowing both learners and instructors to monitor and manage learning outcomes effectively.
12. **Accessibility, Usability, and Language Development**: Ensuring that the e-learning platform is user-friendly aids in navigating English-language content, which is crucial for non-native speakers.
13. **Alignment with EQF/NQF Standards and International Relevance**: The course aligns with European and international standards, and being in English, it is relevant to a wide range of industries worldwide.
14. **Standardized Learning Experience & Language Consistency**: All learners receive the same quality of education, with the added benefit of consistent exposure to English.
15. **Preparation for Digital Work Environments**: Exposure to online learning platforms can help VET learners develop digital literacy skills, which are increasingly important in modern work environments.

Adapting these strategies to an online format, the Wenus training course can provide an effective, engaging, and comprehensive learning experience that meets the needs of VET learners and providers in the timber construction and also enhances their linguistic skills, preparing them for the global business landscape.

Wenus training course methodology

The WENUS course methodology is built on a Web-Based Training (WBT) approach, providing students with flexible and interactive access to educational content through a dedicated e-learning platform. This platform serves as the central hub for learning, allowing students to:

- Access all course materials anytime, anywhere.
- Assess their knowledge through self-evaluation tools and quizzes.
- Enhance learning outcomes by engaging with interactive 3D printing exercises, which provide hands-on reinforcement of key concepts.

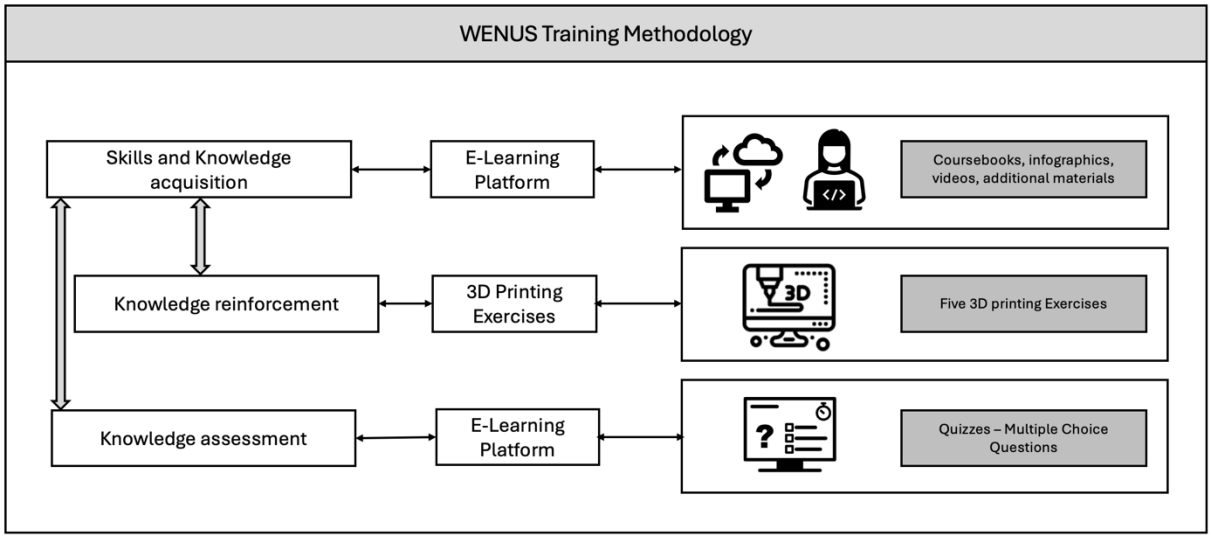


Figure 5: Wenus Training Methodology.

The Wenus **e-Learning platform** will offer an interactive learning experience through a digital platform, enabling learners to engage with course materials at their own pace and convenience. This approach is characterized by its flexibility, accessibility, and adaptability to different learning styles, which is essential for both current and future workers looking to enhance their green and digital competencies.

Assessment Methodology: The Wenus project employs a multiple-choice assessment methodology, which is an effective way to evaluate a learner's understanding and retention of the material. This method provides immediate feedback to learners, reinforcing learning and identifying areas that may require additional focus.

Advantages of Multiple-Choice Assessments:

- Efficient evaluation of learners' knowledge across a wide range of topics.
- Objective grading that eliminates potential prejudice, ensuring fair assessment for all participants.
- Facilitation of self-assessment and reflection, empowering learners to take charge of their learning journey.

Additionally, the Wenus project will develop five 3D printing exercises to apply the knowledges acquired in the modules. This will be designed to complement and synergize with the training modules developed within the project framework and will be focused on vocational training students.

The integration of five structured 3D printing exercises into the WENUS course methodology plays a crucial role in bridging theoretical knowledge with hands-on experience in sustainable timber construction. Their contribution can be summarized as follows:

Active Learning Approach.

Rather than relying solely on theoretical lectures, the 3D printing exercises enable learning-by-doing, increasing student motivation and retention.

Gamification and Design Thinking.

Encourages students to iterate and improve designs based on real-world sustainability challenges, making the learning experience more immersive and creative.

Blended Learning Enhancement.

The exercises provide a tangible connection between e-learning platform content and physical prototyping, reinforcing digital lessons with practical applications.

Sustainability Focus.

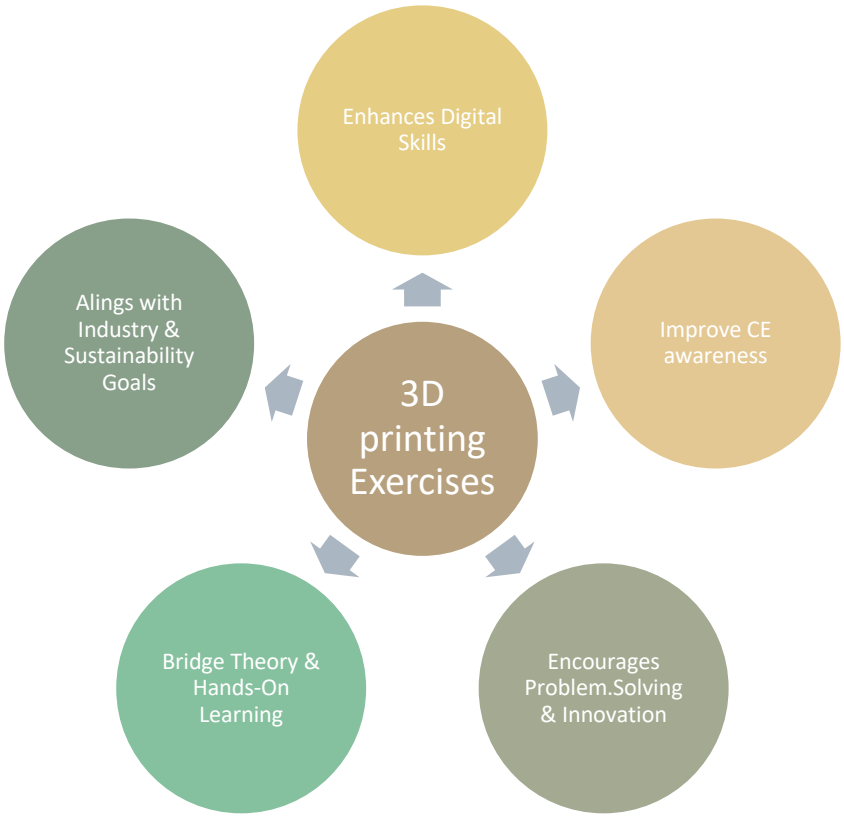
By experimenting with lightweight structures, optimized material use, and prefabricated components, students will gain practical insights into circular economy principles.

Practical Skill Development.

Equips students with hands-on experience in 3D printing, a growing digital skill in the construction sector.

Alignment with Industry Standards.

Reflects real-world applications of digital fabrication in timber construction, ensuring students are prepared for future employment opportunities.



Graphic 1: 3D Printing Exercises Synergies.

Definition of the modules and learning units

As previously mentioned, the Wenus training course consists of four modules, each comprising a total of 15 units. Below, can be find a detailed description of these units, including their general contents, objectives, and learning outcomes. It is important to note that all units are aligned with EQF level 4, which corresponds to NQF level 4 in the consortium countries.

MODULE 1	**Circular Economy (CE) Principles in Timber Construction**	
Duration: 13h	EQF Level:4	NQF Level:4
Assessment Methodology: Multiple choice questions		
Materials: Coursebook, video, infographics.		

Module overview:

Module 1 introduces learners to the fundamental concepts and practical applications of circular economy in the context of timber construction. The module provides a structured pathway from basic CE definitions to specific industry applications, enabling professionals to understand and implement sustainable practices in wood-based construction projects. This module equips learners with the knowledge and understanding needed to transition from traditional construction methods to circular approaches in timber construction, supporting the broader goals of sustainable development in the construction industry.

Learning outcomes:

1. Explain the basic principles of Circular Economy (CE) and their application in timber construction.
2. Describe sustainable sourcing practices for timber and other construction materials.
3. Assess strategies for reducing waste and improving material efficiency in timber construction.
4. Recognize the importance of sustainable material sourcing strategies in the context of CE principles.
5. Demonstrate teamwork and problem-solving skills to address challenges in implementing Circular Economy (CE) principles in timber construction.

Objectives:

1. Understand the principles of Circular Economy (CE).

2. Promote green skills.

Learning Unit 1.1: Introduction to Circular Economy and key definitions.

1. The concept of circular economy.
2. The definitions and key terminology.
3. Historical context and evolution of CE.
4. Role of stakeholders and multisectoral collaboration in CE.

Learning Unit 1.2: Circular economy framework and principles.

1. The circular economy framework.
2. The core principles of CE.
3. The CE business models.
4. Measuring tools and Key Performance Indicators in CE.

Learning Unit 1.3: Circular economy benefits and challenges in the wood and timber construction.

1. Socio-economic benefits.
2. Environmental benefits.
3. Challenges in adopting CE in wood and timber constructions.
4. Current trends and upcoming innovations.

Learning Unit 1.4: Strategies for the timber construction sector (best practices and examples).

1. Lifecycle-oriented design.
2. Sustainable manufacturing techniques.
3. Case studies of best practices and examples.
4. Industry support and policy.

MODULE 2	**Advanced Materials and Sustainable Design in Timber Construction**	
Duration: 17h	EQF Level:4	NQF Level:4
Assessment Methodology: Multiple choice questions		
Materials: Coursebook, video, infographics.		

Module overview:

Module 2 introduces learners to the concepts and applications of advanced materials and sustainable design in the context of timber construction. The module provides a structured pathway from sustainability topics in timber construction to the future trends in timber construction, enabling professionals to understand and implement sustainable practices in wood-based construction projects.

Learning outcomes:

1. Identify the cascading use of materials in timber construction to enhance sustainability.
2. Describe sustainable sourcing practices for timber and other construction materials.
3. Assess strategies for reducing waste and improving material efficiency in timber construction.
4. Recognize the environmental benefits of using advanced timber materials such as cross-laminated timber (CLT).
5. Explain the concept of carbon footprint and its relevance to timber products.
6. Recommend basic material choices aligned with sustainability goals in timber construction.
7. Outline the lifecycle of timber construction materials and identify key stages for reducing environmental impacts.
8. Describe key developments in sustainable timber construction, including the use of innovative materials and low-carbon techniques.
9. Analyse the advantages of timber construction for achieving environmental and economic sustainability.
10. Evaluate simple examples of lifecycle assessment (LCA) in timber construction to assess environmental impacts.
11. Apply critical thinking and collaboration techniques to propose innovative solutions for sustainability challenges in timber construction.

Objectives:

1. Strengthen understanding of advanced materials.
2. Encourage sustainable design thinking.
3. Build awareness of lifecycle assessments (LCA).
4. Promote green skills.

Learning Unit 2.1: Sustainability in timber construction

1. Wood modification.
2. Acoustics in timber construction.
3. Life Cycle Assessment (LCA).
4. Carbon footprint.

Learning Unit 2.2: Advanced materials and design in timber construction

1. Wood composites.
2. Cross laminated timber (CLT).
3. Engineered wood products for construction (ELM).
4. Cascading use of materials.
5. Human health and well-being (including (Restorative Environmental and Ergonomic Design – REED).

Learning Unit 2.3: Building Information Modeling and Smart buildings

1. Digitalisation of built environment - Building Information Modelling.
2. Smart buildings.

MODULE 3	**Industry 4.0 Technologies for Timber Construction**	
Duration: 22h	EQF Level:4	NQF Level:4
Assessment Methodology: Multiple choice questions		
Materials: Coursebook, video, infographics.		

Module overview:

Module 3 introduces key technologies for timber construction, focusing on digital tools and 3D printing. Learners will explore how digitalisation is shaping the construction sector and learn about the practical application of 3D printing to create wooden components.

Through some specific exercises in 3D printing, learners will gain hands-on experience and understand the potential of these technologies in wood construction. The module is designed to be practical and accessible, offering an engaging introduction to these innovative tools.

Learning outcomes:

1. Describe how automation technologies can improve timber construction processes.
2. Explain the role of 3D printing and other advanced digital tools in timber construction.
3. Understand the role of Industry 4.0 technologies in modernizing timber construction processes.
4. Develop adaptability and resilience to effectively integrate and utilize digital tools and Industry 4.0 technologies in timber construction projects.

Objectives:

1. Enhance knowledge of digital tools.
2. Foster understanding of Industry 4.0.

Learning Unit 3.1: Introduction to digitalization and Key Enabling Technologies

Understanding Digital Transformation.

1. Key Enabling Technologies: Overview and Definitions.
    - Building Information Modelling (BIM).
    - Automation and Robotics.
    - IoT (Internet of Things).
    - Artificial Intelligence (AI).
    - Extended Reality.
2. Benefits of Digitalization in Timber Construction.
    - Increased Precision and Efficiency.
    - Waste Reduction.
    - Enhanced Safety.

Learning Unit 3.2: Advanced and Emerging Technologies in Timber Construction

1. Advanced Manufacturing Technologies.
    - Prefabrication Systems.
    - CNC Machines (Computer Numerical Control).
    - Robotics in Manufacturing.
2. Digital Fabrication and Additive Manufacturing.
    - 3D Printing (Additive Manufacturing).
    - Laser Cutting and Engraving.

Learning Unit 3.3: 3D Printing for Timber Construction

1. Fundamentals of 3D Printing.
2. What is 3D printing in Construction?
3. Types of 3D printing in Construction.
4. Applications in Timber Construction.
5. Advantages of 3D Printing.
6. Limitations and Considerations.
7. Case studies of 3D printing in hybrid constructions.

Learning Unit 3.4: 3D Printing exercises definition

1. Integration of 3D printing in Timber Construction.
2. Exercises description and designs.
3. Videos.

MODULE 4	Sustainable Practices and Future Trends	
Duration: 13h	EQF Level:4	NQF Level:4
Assessment Methodology: Multiple choice questions		
Materials: Coursebook, video, infographics.		

Module overview:

Module 4 equips learners with the knowledge and skills to drive sustainable practices in timber construction. It covers green building principles, global certifications (LEED, BREEAM, DGNB), and Green Public Procurement (GPP) policies, providing practical insights into sustainable design and resource management.

Learners will explore future trends, key challenges, and leadership strategies to align timber projects with Sustainable Development Goals. By integrating these concepts, the module prepares professionals to address industry challenges, adopt circular economy approaches, and lead timber construction initiatives toward a sustainable future.

Learning outcomes:

1. Understand basic approaches to solving challenges related to sustainability in timber construction.
2. Interpret basic green public procurement policies and their application in timber construction projects.
3. Describe the principles of green building practices and their integration into timber projects.
4. List the main challenges in the timber industry and propose basic strategies to address them using CE concepts.
5. Explain the connection between timber construction and global sustainability goals, such as SDGs 9 and 13.
6. Exhibit leadership and decision-making abilities to manage and guide sustainable timber construction initiatives.

Objectives:

1. Promote green skills.
2. Explore future trends in timber construction.
3. Integrate green public procurement knowledge.
4. Connect timber construction with global sustainability goals.

Learning Unit 4.1: Sustainable Building Principles for Timber Projects

1. Introduction to Green Building practices.
2. Principles of Green Building.

3. Global certifications: LEED, BREEAM, DGNB, and their applicability.
4. Integration of Green Building practices into timber projects.
5. Case Studies of Green Building in timber construction.

Learning Unit 4.2: Green Public Procurement Policies

1. Overview of Green Public Procurement (GPP).
2. Application of GPP in Construction.
3. Challenges and opportunities in GPP.

Learning Unit 4.3: Shaping the Future of Timber Construction for Global Sustainability: Environmental, Economic, and Leadership Perspectives

1. Future Trends in Timber Construction.
2. Connection Between Timber Construction and Global Sustainability Goals.
3. Developing leadership and team management skills for sustainability.
4. Fostering stakeholder engagement and ethical decision-making.

Learning Unit 4.4: New European Bauhaus

1. New European Bauhaus introduction.
2. New European Bauhaus Academy.

Methodological guide for teachers

This methodological guide is designed for teachers delivering the WENUS Joint Curriculum, a fully online vocational training course focused on sustainable timber construction, circular economy principles, and key enabling technologies.

The guide provides best practices for online teaching, digital tools, and assessment strategies to ensure an engaging and interactive learning experience. Although the course is designed for online delivery, VET educators can adapt it to blended or in-person training if needed.

This methodological guide will serve as the foundation for the development of the "Guide for Trainers", which will be created during WP3. It will also play a key role in testing and implementing the applicability of the content developed for the training course.

Teaching Methodology and Pedagogical Approach for Online Learning

Web-Based Training (WBT) Approach

- Fully online via the WENUS e-learning platform.
- Accessible anytime, anywhere, allowing flexible learning.
- Self-paced modules with interactive elements.

Interactive and Student-Centred Learning

- Use videos, animations, interactive exercises, and simulations to enhance engagement.
- Promote active learning through case studies, real-world scenarios, and problem-solving tasks.
- Encourage collaborative activities using forums, live Q&A sessions, and peer discussions.

Blended Learning Option (For VET Educators in Physical Classrooms)

- Teachers can combine online modules with in-person discussions and workshops.
- Encourage hands-on application of digital fabrication and 3D printing using real materials if possible.
- Assign group projects or debates in classroom settings to reinforce online content.

Competency-Based Learning in an Online Environment

- The JC focuses on practical, real-world applications of sustainable timber construction.
- Learning activities align with European Qualifications Framework (EQF) Level 4.
- Soft skills (teamwork, critical thinking, leadership) are developed through interactive tasks.

Structuring the Online Learning Experience

Course Modules and Learning Units

The Joint Curriculum consists of four fully online modules, each covering key aspects of sustainable timber construction.

Module	Key Topics	Online Teaching Approach
1. Circular Economy Principles in Timber Construction	Understanding and applying circular economy principles to optimize material efficiency, reduce waste, and promote sustainability in timber construction.	Self-paced reading materials combining videos, infographics, and real-world case studies, followed by multiple-choice quizzes to assess understanding of circular economy principles in timber construction.
2. Advanced Materials & Sustainable Design in Timber Construction	Exploring innovative materials, life cycle assessment, and digital tools to enhance the sustainability and performance of timber-based buildings.	Text-based modules with clear explanations of sustainable materials and lifecycle assessments, reinforced by self-evaluation quizzes at the end of each unit.
3. Key Enabling Technologies for Timber Construction	Integrating Industry 4.0 technologies, digital fabrication, and 3D printing to improve timber construction processes and efficiency	Hands-on virtual exercises, self-guided software tutorials, and interactive quizzes to understand Industry 4.0 and 3D printing applications in timber construction.
4. Sustainable Practices and Future Trends	Aligning timber construction with global sustainability goals through green building principles, policy-driven procurement, and future design innovations.	Theory-driven lessons covering sustainable building policies and future trends, followed by knowledge-check quizzes to reinforce key concepts.

Online Lesson Planning

A well-structured online module should follow this format:

1. **Introduction:** Short video or reading material explaining key concepts.
2. **Engagement Activity:** Interactive quiz, reflection question, or discussion forum task.
3. **Main Content:** Combination of videos, infographics, coursebook, and readings.
4. **Practical Application:** Virtual simulation, case study, or problem-solving task.
5. **Assessment & Reflection:** Self-paced quiz, peer-reviewed project, or summary discussion.

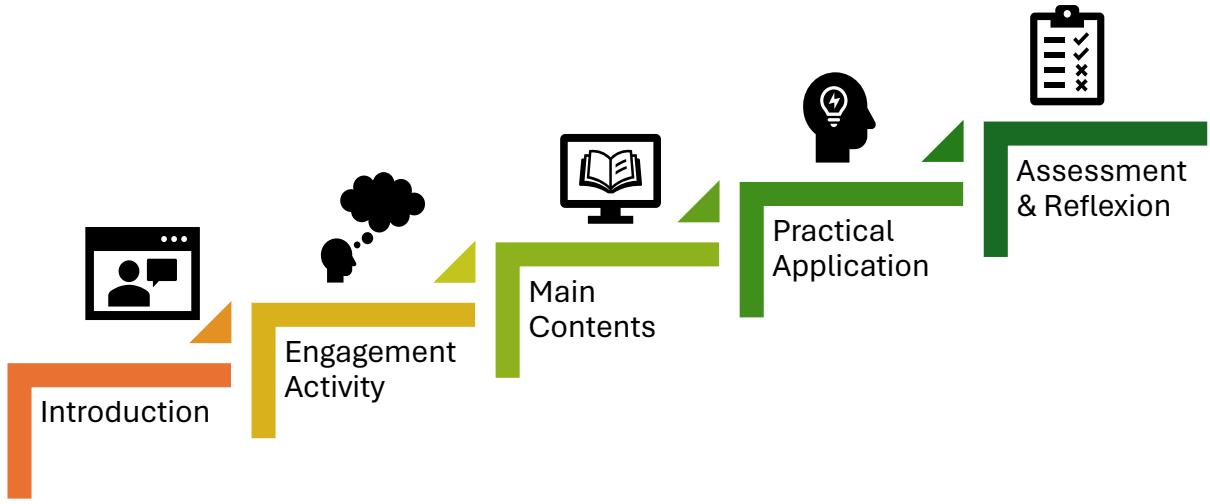


Figure 6: WENUS - Online module structure.

Online Assessment and Evaluation Strategies

Formative Assessment (Ongoing Evaluation in the Platform)

- Self-assessment tools to track progress.
- Summative Assessment: Multiple-choice tests to assess technical knowledge.
- Practical 3D printing assignments (students can design virtually).
- Project-Based Online Assessment

Integrating 3D Printing in a Fully Online Course

Since the course is fully online, 3D printing exercises must be adapted for virtual learning:

- Display 3D models through the eLearning platform.

- Virtual 3D Modelling. Use free software tools (Tinkercad, SketchUp…) to create digital designs.
- Online Tutorials & Simulations. Provide step-by-step guides and videos demonstrating 3D printing applications in timber construction.

Best Practices for Teaching Online in the WENUS Project

- Use Digital Tools Effectively: Leverage BIM examples, 3D designs models, and online quizzes.
- Make Learning Visual & Engaging: Include interactive videos, animations, and infographics.
- Offer Flexible Deadlines: Allow students to learn at their own pace while setting reasonable deadlines.
- Incorporate Industry Insights: Provide real-world applications of timber construction and CE principles.

Conclusions

The development of the WENUS Joint Curriculum has been a collaborative and structured effort to modernise vocational education and training in the timber construction sector. Through the integration of circular economy principles, sustainable materials, and digital technologies, this curriculum responds to the evolving needs of the industry while aligning with European sustainability goals.

Designed with flexibility and accessibility in mind, its modular structure allows for a fully online, self-paced learning experience, supporting both lifelong learning and learning on demand. The approach is built on web-based training and competency-based learning, ensuring that learners gain practical knowledge and the necessary assessment tools to reinforce key concepts effectively.

To enhance its recognition and applicability, the curriculum is aligned with EQF Level 4 and incorporates ECVET principles, making it adaptable across different national qualification frameworks. Additionally, it will undergo a validation and adaptation process, involving industry experts and educators, to further confirm its relevance and effectiveness in tackling both current and future challenges within the sector.

Following this validation phase, the WENUS project will progress to Work Package 3 (WP3), where the training contents and 3D printing exercises will be developed. This phase will focus on creating interactive and engaging learning materials that align with the curriculum's objectives. Subsequently, in Work Package 4 (WP4), these training contents will be integrated into a dedicated e-learning platform, ensuring broad accessibility and a high-quality learning experience for all users.

This document serves as a comprehensive guide to the curriculum's structure, learning outcomes, and pedagogical approach, providing a valuable resource for educators, trainers, and professionals. With this initiative, the WENUS project aims to lay a strong foundation for equipping future professionals with digital and green skills, reinforcing the timber construction sector's transition toward sustainability and innovation.

Co-funded by the European Union