Energy Saving Teacher Competences

D5.5 Responsible: USUST

Date: January, 2026

VETpartEX

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Erasmus+ Project	Future Oriented VET for the Construction Sector in Ukraine in a Partnership for Excellence
Project ID	VETpartEX / Erasmus-EDU-2024-CB-VET / ID 101183275
Title of the document	WP5 D5.5 Energy Saving Teacher Competences
Author(s) (name, surname, institution)	Yevhenii Yurchenko, Olena Koval, USUST
Contributor(s) (name, surname, institution)	Maryna Babenko, STUBA
Submission date	7.1.2026
Reviewer(s) (name, surname, institution)	Michael Erz, BOT Marc Krüger, FHMS
Final publication date	
Revision after upload	-
Version	V1.0
Work package	WP 5
Work package leader	USUST
Deliverable	D 5.5
Type	Report
Format	PDF
Distribution	Public
Summary:	This deliverable describes how Techer Competences for Energy Saving were developed. It outlines the methodology, describes the implementation of the work, and presents the results in the appendix.

Table of Contents

1. Introduction

This document defines the professional competences required of vocational education and training (VET) teachers to teach energy-saving and sustainable construction, in line with European standards and labor market needs.

The result is a structured Competence Framework for teachers in energy saving, designed to guide the development of training programs within Work Package 3. This framework ensures that teachers are prepared to lead energy-saving and energy-efficiency initiatives in construction, reflecting the EU's policy objectives under the Green Deal, Digital Europe, and New European Bauhaus initiatives.

The integration of energy-saving, energy-efficient, and sustainable construction practices is a transformative step in modernizing vocational education for the construction sector. These approaches are central to Europe's dual transition—digital and green—and are essential for equipping teachers with the relevant skills. This outcome identifies and specifies the competences required by vocational education and training teachers to teach energy-related content in line with European frameworks and labor market requirements. The main objectives are to identify key competences, align them with EU frameworks, and support the development of training programs within the VETpartEX project.

2. Methodology

The methodology applied in this deliverable follows a simplified, context-specific approach, given the focus of the available data. Four main activities formed the basis of competence identification and validation:

Step 1: Literature Review - The first phase of the methodology involved a targeted literature review to establish the conceptual and theoretical foundation for competence identification in Energy Saving within vocational education and training (VET).

This review included the collection and analysis of relevant academic and institutional publications, reports on EU-level projects, and policy frameworks related to energy conservation, energy efficiency, and procedural learning in the construction sector. The analysis focused on three main aspects: reducing the carbon footprint, enhancing energy efficiency in line with European frameworks, and prioritizing the energy-efficient reconstruction of Ukraine.

The findings from this step provided the conceptual grounding for subsequent phases. Specifically, they informed the design of the course assessment and teacher needs analysis, ensuring that all competence definitions **were aligned with current European educational trends and VET priorities.**

Step 2: Assessment of existing USUST courses: A detailed review of USUST course modules on energy efficiency and energy conservation was conducted to assess the relevance of content, structure, and competency alignment. The USUST modules that were analyzed were developed and refined in accordance with European requirements and have been successfully tested in Erasmus projects at the master's level of education. The modules covered topics ranging from the basics of energy efficiency and the principles of sustainable development to the introduction of energy-efficient innovative technologies. The analysis formed the basis for identifying competencies that can be transferred and applied in the vocational education system. This dual-source methodology ensured that the identification of competencies was based on the needs of teachers, proven European educational practices, and programs that had already been adapted to the conditions and needs of the Ukrainian market.

Step 3: Assessment of teachers' needs in Ukraine: Semi-structured interviews were conducted with Ukrainian vocational education teachers and workshop instructors participating in the VETpartEX project. The purpose of the interviews was to identify gaps in teachers' knowledge, their expectations, and priorities in training related to energy saving and energy efficiency. The results showed limited use of energy auditor tools and instruments, a need for practical teaching methods, and high motivation to learn energy-saving and energy-efficient methods and approaches.

Step 4: Identification of the intersection between course content and teacher needs:

The results of the USUST course analysis and interviews with Ukrainian teachers were cross-analyzed to identify areas of convergence and divergence. This comparative analysis enabled us to identify cross-cutting competencies — a set of energy-saving skills that are already available in the educational resources of EU partners, have been successfully integrated into higher education, and are clearly needed in Ukrainian vocational education practice.

This step ensured the scientific validity and readiness for implementation of the resulting competency system, as it is based on proven European teaching materials and programs that have already been implemented in Ukrainian education and directly address the specific professional development needs of Ukrainian teachers. The intersection analysis became a conceptual link between the availability of courses and the actual requirements for classroom teaching, forming the basis for the competency matrix developed within this project.

Fig.1. Dual-Source Validation

The dual approach to validation ensured that competencies were defined based on both proven European educational practices and the real needs of Ukrainian teachers at vocational and technical educational institutions. On the one hand, European educational practices were represented by proven modules from the energy conservation course implemented at USUST, which provided a structured basis for the technical content. At the same time, information about the needs of Ukrainian teachers was obtained through direct feedback from teachers at vocational and technical educational institutions, which enabled the identification of existing gaps in skills, practical challenges, and expectations regarding training. The combination of these two data sources enabled the definition of a validated competency system — a set of ready-to-implement competencies that align with both existing educational resources and the realities of the learning process. This dual validation process increased the reliability, contextual relevance, and transferability of the resulting competency model.

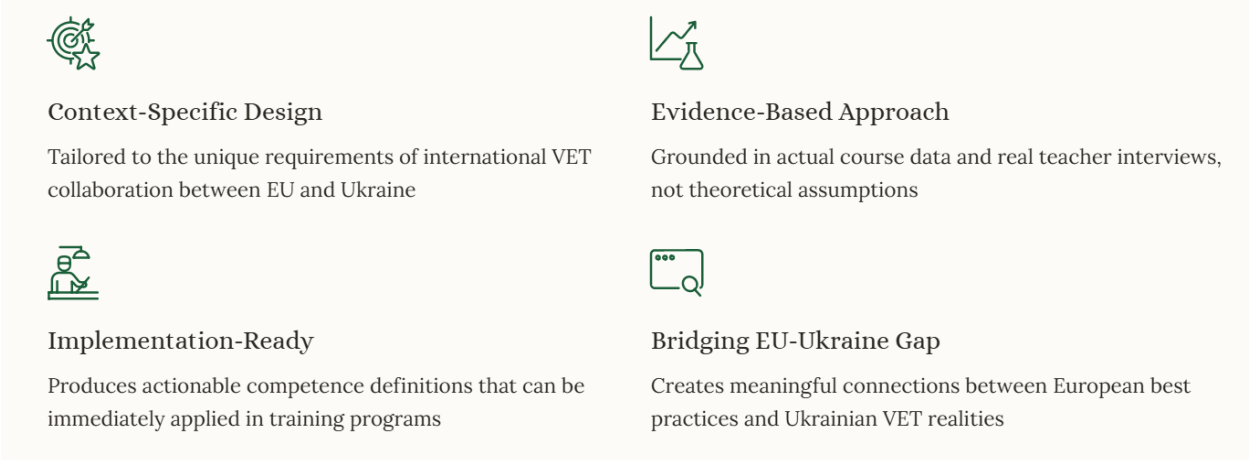

Fig. 2. Methodology Strengths

The applied methodology demonstrates strong contextual relevance by tailoring its design to the specific needs of EU–Ukraine VET collaboration. It combines an evidence-based approach, using both validated course materials and authentic teacher feedback, to ensure practical and

data-driven outcomes. As a result, the methodology produces implementation-ready competences that effectively bridge European best practices with the realities of Ukrainian vocational education.

3. Implementation

In this chapter, we describe the development of the basis for the teacher competency matrix. The next step explains how we identified the sectoral challenges in Ukraine and assessed the Ukrainian need for vocational teacher training.

3.1 Literature Review

Energy efficiency and energy saving are integral components of a country's energy security and sustainable, innovative development. Against the backdrop of current events in the global energy arena, with Russia threatening the civilized world with energy blackmail, the issue of reducing dependence on imports of traditional energy resources has become more relevant than ever for both Ukraine and the EU. [5]

Ukraine has made significant progress in fulfilling its obligations under the Association Agreement with the EU regarding the implementation of European legislation on energy efficiency. In recent years, a legislative framework aimed at reforming energy efficiency and energy saving has been developed and adopted, in particular:

- The Law of Ukraine “On Energy Efficiency,” which provides for the establishment of legal, economic, and organizational foundations for activities in the field of energy efficiency, ensuring the implementation of energy efficiency measures to be carried out during the production, transportation, transmission, distribution, supply, and consumption of energy [1];
- The Law of Ukraine “On the Introduction of New Investment Opportunities, Guaranteeing the Rights and Legitimate Interests of Entrepreneurs for Large-Scale Modernization of the Energy Sector” (as amended) [2];
- Law of Ukraine “On Amendments to the Budget Code of Ukraine Regarding the Introduction of New Investment Opportunities, Guaranteeing the Rights and Legitimate Interests of Business Entities for Large-Scale Modernization of the Energy Sector” [3];
- Law of Ukraine “On Commercial Accounting of Thermal Energy and Water Supply.” [4]

The Law of Ukraine “On Energy Efficiency” has become the driver of reforms in the field of energy efficiency. Thanks to this law, Ukraine has completely abandoned outdated

administrative tools for energy conservation and is transitioning to modern European practices for implementing energy efficiency policies. Ukraine is already working on:

- the implementation of energy audits and energy management systems;
- the introduction of a national energy efficiency monitoring system;
- the development of energy services;
- introducing eco-design and energy labelling for energy-consuming products;
- developing local energy planning;
- ensuring a steady increase in the energy efficiency of end-use energy consumption by setting a target for annual energy consumption reduction;
- developing state target programs to support energy efficiency in various sectors, etc.

Introduction of European approaches to strategic planning and setting energy efficiency and energy saving targets. On December 29, 2021, the Government approved the National Energy Efficiency Action Plan for the period up to 2030, which sets a national energy efficiency target for 2030: primary and final energy consumption in Ukraine in 2030 should not exceed 91,468 thousand tons and 50,446 thousand tons of oil equivalent, respectively.

The National Plan also establishes and describes a number of horizontal and sectoral measures to achieve this goal (in the areas of residential and budgetary buildings, transport, industry, and energy).

According to the modelling results, in 2030, under the energy-efficient scenario, energy consumption is expected to decrease by 22.3% (primary energy) and 17.1% (final energy) compared to the baseline scenario.

According to preliminary estimates, the implementation of the measures of the National Energy Efficiency Action Plan will require financial resources (from all sources) of approximately €56 billion.

Synthesizing the findings of EU-level projects and initiatives aimed at modernizing vocational education and training, the literature review highlights that competency development should integrate the practical application of energy efficiency improvement methods and energy conservation tools. The review also reveals a growing trend towards the use of energy audit equipment, tools, and collaborative learning platforms in teacher training. This evidence base provides a solid foundation for evaluating existing course modules and developing competency frameworks tailored to the needs of Ukrainian vocational education.

3.2 Overview of the available courses in Energy Saving

The energy-saving course modules provide a structured and pedagogically rich framework for developing competence in energy efficiency and conservation. The curriculum begins with an overview of industry trends, considering energy savings within the context of broader transformations, such as sustainable development, green building, and energy-efficient reconstruction. This introductory session helps instructors contextualize technological innovations in relation to labor market developments and policy priorities.

The Energy Audit and Energy Certification module focuses on the principles of conducting energy audits and certifying buildings for energy efficiency. Teachers will be able to learn about the methods and means of conducting energy audits and energy certification of buildings, as well as familiarize themselves with the equipment used by energy auditors. The skills acquired will help teachers adjust their curricula with a focus on Ukraine's energy reconstruction.

A logical continuation is the “Building Thermography” module, which focuses on providing teachers with theoretical knowledge and practical skills in conducting building thermography and identifying thermal failures in building envelopes. The emphasis is on practical work with a thermal imager, analyzing thermograms, and compiling reports.

The “Microclimate Monitoring” module provides teachers with knowledge about how microclimate parameters affect the health of residents, how to monitor these parameters, and how to manage the life cycle of a healthy building. Demonstrations of common microclimate parameter tools and interfaces will be included.

The “Energy Balance of Buildings” module will help you analyses a building as a single energy system. Teachers will learn about the principles of forming the energy balance of buildings and analyzing energy efficiency indicators. The module includes simple classroom activities that demonstrate energy conservation and energy efficiency-oriented thinking.

The course concludes with the module “Evaluation of Energy Saving Measures.” This module will provide teachers with the skills to develop, evaluate, and implement energy conservation and energy efficiency measures in buildings. Teachers will explore how to evaluate the economic and environmental effects of implementing energy conservation measures. The emphasis is on improving energy efficiency when rebuilding damaged buildings.

Combining theoretical foundations, real-world case studies, and classroom-ready assignments, the Energy Saving curriculum offers a model for integrating modern technologies and process innovations into vocational education programs. This structured

progression—from conceptual understanding to applied competencies—ensures that teachers have everything they need to guide students toward modern construction practices, while taking into account both European standards and local needs in Ukraine.

3.3 Interview of Ukrainian VET teachers

The questionnaire aimed to determine the current level of awareness, use, and training needs related to energy saving and energy efficiency in buildings and sustainable construction among vocational education and training (VET) teachers. Responses were collected from teachers of construction disciplines from various Ukrainian educational institutions, reflecting a variety of regional and institutional perspectives.

Teaching Experience and Digital Familiarity

Most respondents have over 10 years of teaching experience, with a smaller proportion representing early-career educators.

Fig. 3 Teaching experience

Most respondents indicated that they were familiar with the latest editions of regulatory and technical documentation relating to energy conservation and energy efficiency in Ukraine and had some experience working with documentation, as they were involved in teaching subjects such as: "Welding Technology", "Materials Science", "Technology and Organization of Finishing Works", "Occupational Safety", "Building Structures and Fundamentals of Calculations".

Fig.4 Knowledge of regulatory and technical documentation

Identified challenges and priorities in construction education

Teachers unanimously identified the modernization of curricula with an emphasis on innovative energy-saving technologies, the use of modern tools, and the harmonization of curricula with EU standards as urgent priorities. Specific challenges include the lack of a developed material and technical base, as well as limited institutional resources. Some of them noted the importance of dual education and cooperation with business to ensure that training meets market requirements and supports post-war reconstruction.

Assessment of energy efficiency of buildings and practices of implementing energy-saving measures

This section provides an overview of questions regarding the assessment of the current state of buildings and energy efficiency practices in the organization, as well as the involvement of participants in the educational process.

The answer to the question "Have your organization’s buildings undergone energy efficiency certification?" reflects the availability and results of energy efficiency certification for the organization’s buildings, as required by current legislation. Certification allows you to assess the energy consumption of buildings, determine their energy efficiency class and identify potential for further energy efficiency improvements. According to the survey results, 50% of respondents said that their organizations do not have energy certificates for buildings.

Fig.5. Energy efficiency certification of buildings

Conducting energy audits in the organization's buildings, their frequency, and the main results. Energy audits enable the identification of the primary sources of energy loss, evaluation of energy efficiency, and formulation of recommendations for implementing energy-saving measures. According to the survey results, 50% of respondents did not conduct energy audits in their organization's buildings.

Fig.6. Conducting energy audits in the organization's buildings

The section on implementing energy efficiency projects within the organization describes the experience of implementing projects and measures aimed at reducing energy consumption and enhancing the energy efficiency of buildings and processes. Such measures may include the modernization of engineering systems, insulation of buildings, the replacement of lighting with energy-efficient alternatives, and the introduction of energy monitoring systems, among others. According to the survey results, 43% plan to implement energy efficiency measures, while 50% have already implemented at least some low-cost energy efficiency measures.

Fig.7. Implementation of energy efficiency projects

The answer to the question "Did teachers and students participate in the implementation of energy efficiency measures?" highlights the level of involvement of teaching staff and students in the implementation of energy efficiency initiatives. The participation of teachers and students contributes to the formation of a culture of energy conservation, the development of practical skills for the rational use of energy resources, and the raising of environmental awareness among all participants in the educational process. According to the survey results, 79% of respondents have experience in implementing energy efficiency measures.

Fig.8. Participation in the implementation of energy efficiency measures by teachers and students

Competence Gaps and Training Needs

During the survey, respondents highlighted gaps in regulatory and technical competencies as well as competencies in energy analysis and auditing, namely:

- The need to familiarize themselves with changes in legislation in the field of energy efficiency of buildings and energy certification.
- Limited understanding of the requirements for energy audits, minimum energy performance of buildings, and standards (DBN, DSTU, EN).

- Lack of experience with equipment for energy audits of buildings and monitoring of microclimate parameters. The survey revealed that 57% of respondents have no experience in monitoring indoor microclimate parameters, and 64% of respondents have no practical experience in working with equipment for energy audits of buildings.
- Insufficient knowledge of thermal protection of building envelopes.
- Lack of skills in a comprehensive approach to designing buildings as a single energy system.
- Insufficient training in conducting energy audits of buildings.
- Limited skills in collecting, analyzing, and interpreting energy consumption data.
- Inability to justify energy-efficient solutions from an economic point of view.

Fig. 9. Experience in monitoring microclimate parameters in rooms

Fig. 10. Experience working with equipment for energy audits of buildings

Training needs:

- Training on the current regulatory framework in the field of energy efficiency.
- Overview of changes in legislation and their impact on construction practice.
- Acquisition of competencies in modern energy efficiency technologies.
- Training in energy audit and certification methodology.
- Practical skills in working with energy audit software tools.
- Theoretical skills in the economic assessment of energy efficiency measures and the implementation of renewable energy sources.

Fig. 11. Advanced training on energy conservation and energy efficiency

Fig. 12 Inclusion of energy efficiency and energy conservation modules in educational programs

More than 30% of respondents did not undergo advanced training in energy efficiency and energy conservation, despite the fact that 79% of educational programs include modules on energy efficiency and energy conservation in educational programs such as "Technological solutions in energy efficiency of finishing works" - 8 hours, "Energy-efficient and energy-saving solutions in construction" - 15 hours.

Development of professional competencies of specialists

Within the framework of the survey of vocational education institutions, information was collected on the needs for developing professional competencies of specialists, as well as priority areas for improving their qualifications. Particular attention was paid to identifying areas of knowledge and practical skills that need improvement in view of the current requirements of the construction industry and the introduction of energy-efficient technologies. A separate section examined respondents' interest in acquiring specialized competencies, particularly in the field of building air permeability testing technologies, as an important element in ensuring energy efficiency and construction quality, carbon emissions monitoring, and experience in 3D building scanning. Further analysis of the responses enables us to identify current training needs and pinpoint promising areas for developing educational programs and practical training for specialists.

Fig. 13 Specialists' needs for improving professional competencies

Fig. 14 Specialists' needs for improving professional competencies

53% of respondents are interested in improving their professional competencies in the energy balance of buildings, 26% in heat transfer in building envelope structures, 59% in the basics of microclimate parameters, and 41% in the basics of thermophysics. Additionally, 68% of

respondents plan to enhance their practical skills in evaluating the effectiveness of energy efficiency measures.

Fig. 15 Improving practical skills

The following analysis of responses to questions aims to identify the technical and educational needs of specialists in the field of energy auditing. In particular, it examines the planned use of specialized equipment necessary for conducting energy surveys and outlines priority areas of knowledge that require further improvement in order to enhance the quality and effectiveness of professional activities. The responses received allow us to assess the level of readiness of specialists for the practical application of modern energy audit methods and to identify areas for the development of relevant training programs.

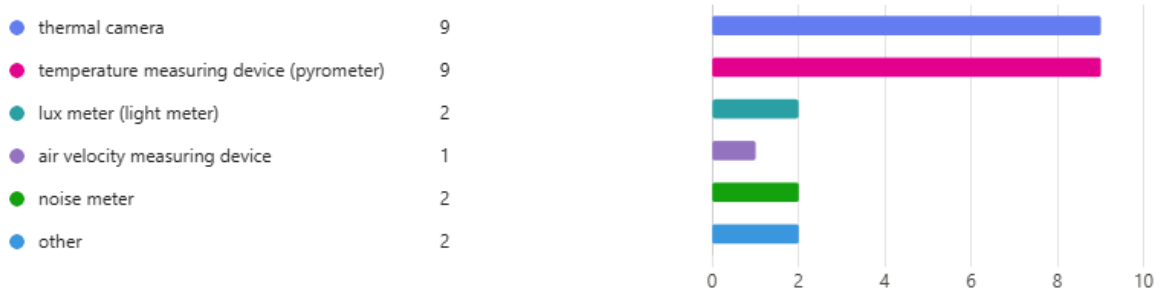

Fig. 16 Use of equipment for energy audits

Most respondents plan to use thermal imagers and devices for measuring microclimate parameters in buildings in their future activities. However, 31% of respondents need to improve their technical knowledge, 24% need to improve their digital knowledge, and 17% need to improve their communication (soft skills).

Fig. 17 Areas of knowledge that need improvement

When it comes to innovative technologies and the use of modern equipment for energy auditing and monitoring, 57% of respondents are interested in gaining expertise in building air permeability testing, 43% in carbon emissions monitoring, and 71% in gaining experience with 3D building scanning.

Fig. 18 Interest in acquiring competencies in the field of building air permeability testing technology

Fig. 19 Interest in acquiring competencies in the field of carbon emissions monitoring

Fig. 20 Interest in gaining experience in the field of 3D scanning of buildings

4. Results

4.1 Overview of Outcomes

The results of the analysis show that the development of the Energy Saving Teacher Competency Framework is based on two complementary sources: (1) proven European educational practices that have been tested in Ukrainian universities, and (2) a comprehensive assessment of the needs of Ukrainian vocational education teachers. This dual foundation ensures that the final competency model is both theoretically sound and practically applicable, as well as contextually relevant for vocational education institutions in Ukraine.

4.2 Key Findings from the Course Review

A review of the six Energy Saving modules confirmed that the training program provides:

- A solid technical foundation (from theoretical energy efficiency issues to practical skills in working with modern equipment).
- Alignment with EU policy priorities, including sustainable development, carbon footprint reduction, and energy-efficient reconstruction.
- A focus on training knowledgeable specialists to implement Ukraine's energy-efficient reconstruction program.

These conclusions laid the conceptual and methodological foundation for developing a set of competencies that can be transferred to the training of vocational education teachers in Ukraine.

4.3 Key Findings from the Ukrainian Teacher Questionnaire

In all institutions, teachers expressed strong motivation to introduce a course on energy efficiency and energy conservation, while noting obstacles such as:

- lack of developed material and technical resources, outdated equipment,
- insufficient practical teaching materials,
- need for real-life examples of projects demonstrating the actual implementation of energy-saving measures.

Most respondents reported a basic or intermediate level of knowledge of energy conservation theory and limited experience with modern equipment and innovative energy-efficient technologies. Respondents consistently expressed interest in:

- short face-to-face master classes,
- mixed or hybrid seminar formats,
- exchange of experience with EU teachers,
- case studies demonstrating modern innovative technologies in construction.

According to the survey, the priority areas for teacher training are focused on energy-saving measures and innovative technologies that can be directly implemented in the buildings of vocational education institutions. An additional bonus is the opportunity to involve students in implementing these measures. A comparison of the USUST course content with the needs identified in the survey of Ukrainian vocational education teachers revealed a significant correspondence on the following topics:

- Overview of trends in energy saving, energy efficiency, and green construction
- Conducting energy audits in buildings and energy certification of buildings
- Thermography of buildings
- Monitoring microclimate parameters
- Monitoring microclimate parameters
- Evaluation of energy-saving measures

This synthesis formed the foundation for the final competence matrix. (Appendix 3)

4.4 Resulting Competence Structure

The final competency framework developed within this project consists of three interrelated areas of competency:

a) Energy efficiency competencies – including optimization of energy efficiency improvement processes, carbon emission reduction, continuous improvement, and workflow planning.
b) Competencies in the field of energy efficiency in buildings, including relevant aspects of energy-efficient reconstruction in Ukraine.
c) Competencies in the field of sustainable development and EU standards – covering environmental indicators, the EU regulatory framework, standardization, and safety.

Each module contains a description of the competence, learning outcomes in terms of knowledge and skills, relevance to vocational education and training, and references to EU and Ukrainian standards. This structure ensures that the results can be used in the development of training programs (WP3) and reflects both European best practices and the practical needs of Ukrainian vocational education teachers.

References

1. The Law of Ukraine “On Energy Efficiency. Access mode: https://zakon.rada.gov.ua/laws/show/1818-20#Text
2. The Law of Ukraine “On the Introduction of New Investment Opportunities, Guaranteeing the Rights and Legitimate Interests of Entrepreneurs for Large-Scale Modernization of the Energy Sector” (as amended). Access mode:https://zakon.rada.gov.ua/laws/show/327-19#Text
3. Law of Ukraine “On Amendments to the Budget Code of Ukraine Regarding the Introduction of New Investment Opportunities, Guaranteeing the Rights and Legitimate Interests of Business Entities for Large-Scale Modernization of the Energy Sector”. Access mode: https://zakon.rada.gov.ua/laws/show/328-19#Text
4. Law of Ukraine “On Commercial Accounting of Thermal Energy and Water Supply.” https://zakon.rada.gov.ua/laws/show/2119-19#Text
5. Website of the State Agency for Energy Efficiency and Energy Saving of Ukraine. Access mode: https://saee.gov.ua/diialnist/enerhoefektyvnist/enerhoefektyvnist

Appendixes

Appendix 1: List of relevant EU and Ukrainian standards referenced

A.1 EU technical and construction standards

EN 1990–1999 (Eurocodes): Structural design standards covering actions on structures, concrete, steel, timber, masonry, geotechnics, seismic design, and more.

EN ISO 52000 series: Standards related to the energy performance of buildings framework.

EN ISO 50002 Energy audits – Requirements with guidance for use

EN 15603 Energy performance of buildings — Overall energy use and definition of energy ratings.

EN 15804: Sustainability of construction works – Environmental Product Declarations (EPDs) – Core rules for the product category of construction products.

EN 16247-1 Energy audits — Part 1: General requirements

EN 16247-2:2014 Energy audits — Part 2: Buildings

EN ISO 6946: Building components and building elements – Thermal resistance and thermal transmittance – Calculation method.

A.2 Ukrainian technical and construction standards

DBN V.1.2-11:2021 - Basic requirements for buildings and structures. Energy saving and energy efficiency

DBN V.2.6-31:2021 - Thermal insulation of buildings and energy efficiency of buildings

DSTU B V.2.2-39:2016 - Methods and phase of conducting energy audits of buildings

DSTU 9190:2022 - ENERGY PERFORMANCE OF BUILDINGS. Method for calculation of energy use for space heating, cooling, ventilation, lighting and domestic hot water

DSTU 9191:2022 - Thermal insulation of buildings. Method for selecting thermal insulation material for insulating buildings

Professional standard “Energy auditor of buildings” / Ministry of Development of Communities, Territories, and Infrastructure of Ukraine (Order No. 859 of September 22, 2023)

A.3 Recommended Open Educational or Demonstration Tools

CadEE.pro - web application for calculating the thermal characteristics of building envelopes and the energy efficiency of buildings in accordance with Ukrainian building codes.

Lean Simulation Games (e.g., LEGO® Serious Play) – Used in classrooms to demonstrate flow and waste concepts.

NREL's PVWatts® Calculator - Estimates the energy production of grid-connected photovoltaic (PV) energy systems throughout the world. It allows homeowners, small building owners, installers and manufacturers to easily develop estimates of the performance of potential PV installations.

Testo IRSoft - a tool for working with thermograms

.

Appendix 2: Teacher Topic List

Module	Title	Content Description
1	Overview of trends in energy saving, energy efficiency, and green building	This module introduces contemporary global and regional trends shaping the energy-efficient construction industry. The focus is on green construction, energy-efficient renovation, and efficient use of resources. Teachers will learn about challenges such as the shortage of qualified energy-saving specialists, rising renovation costs, and the pursuit of climate goals. Emphasis will be placed on how challenges and innovations are changing the industry and influencing professional education.
2	Providing energy audits in buildings and energy certification of buildings	Focuses on the principles of conducting energy audits and certifying buildings for energy efficiency. Teachers will be able to learn about the methods and instruments for conducting energy audits and energy certification of buildings. The skills acquired will help teachers adjust their curricula with an emphasis on Ukraine's energy reconstruction
3	Thermography of buildings	This module focuses on providing teachers with theoretical knowledge and practical skills in conducting thermography of buildings and identifying thermal failures in building envelopes. The emphasis is on practical work with a thermal imager, analyzing thermograms, and compiling reports. In addition, teachers will learn about the theory and practice of instrumental quality control of construction work (window installation, installation of facade insulation systems).
4	Monitoring of microclimate parameters	Focuses on the principles of monitoring microclimate parameters, explaining their role in creating comfortable indoor conditions. Teachers will gain an understanding of how microclimate parameters affect the health of occupants, learn how to monitor these parameters, and develop

		strategies for managing the life cycle of a healthy building. Demonstrations of common microclimate parameter tools and interfaces will be included
5	Energy balance of the building	Provides an understanding of buildings as a single energy system. Teachers learn about the principles of energy balance in buildings and the analysis of energy efficiency indicators. The module includes simple classroom activities that demonstrate energy conservation and energy efficiency thinking.
6	Energy-saving measures assessment	This module focuses on the development, assessment, and implementation of energy conservation and energy efficiency measures in buildings. Teachers will explore how to assess the economic and environmental impact of implementing energy conservation measures. Emphasis is placed on improving energy efficiency when rebuilding damaged buildings.

Appendix 3: Teacher Competence Matrix – Energy Saving

Co-funded by the European Union	EU project	VETpartEX			
ECVET Points:	(if applicable)				
ECTS Credits:	3				
EQF Level: 6	UA	CZ	DE	NO	SK
NQF Level:					
Units of Learning Outcomes	U1	Overview of trends in energy saving, energy efficiency, and green building			
	U2	Providing energy audits in buildings and energy certification of buildings			
	U3	Thermography of buildings			
	U4	Monitoring of microclimate parameters			
	U5	Energy balance of the building			
	U6	Energy-saving measures assessment			

Disclaimer: This is one of the actions of the VETpartEX project which has been co-funded with support from the European Union. This document reflects the views only of the project partners, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Overview of trends in energy saving, energy efficiency, and green building	Unit	Competence	
		Knowledge	Skills
This module introduces contemporary global and regional trends shaping the energy-efficient construction industry. The focus is on green construction, energy-efficient renovation, and resource efficiency. Emphasis is placed on how challenges and innovations are changing the industry and influencing professional education.	U1	Teachers will be able to explain the principles of sustainable development in construction and demonstrate the basic principles of energy efficiency and energy conservation policy in the classroom.	
		• Principles and terminology in the field of energy-efficient construction and reconstruction • State building codes, regulations, and standards in the field of energy efficiency in buildings • Fundamentals of green construction • Industry trends and challenges	• Comply with the requirements of regulatory acts and the requirements of regulations and standards governing professional activities • Identify factors that may influence the process of improving energy efficiency • Critically evaluate the information received regarding energy conservation

Providing energy audits in buildings and energy certification of buildings	Unit	Competence	
		Knowledge	Skills
Focuses on the principles of conducting energy audits and certifying buildings for energy efficiency. Teachers will be able to learn about the methods	U2	Teachers will know how to apply the work processes of building energy auditing and energy certification in teaching and guide students in performing simple coordination and planning tasks.	

and instruments for conducting energy audits and energy certification of buildings. The skills acquired will help teachers adjust their curricula with an emphasis on Ukraine's energy reconstruction		• Types and kinds of measuring equipment necessary for energy audit purposes • Basic knowledge of energy efficiency in buildings • Architectural and structural features of building envelopes • Building engineering systems	• Use measuring equipment necessary for energy audit purposes • Perform the necessary measurements at the energy audit site • Conduct surveys and necessary measurements of the geometric characteristics of buildings and engineering systems

Thermography of buildings	**Unit**	**Competence**	
		Knowledge	**Skills**
This module focuses on providing teachers with theoretical knowledge and practical skills in conducting thermography of buildings and identifying thermal failures in building envelopes. The emphasis is on practical work with a thermal imager, analysing thermograms, and compiling reports. In addition, teachers will learn about the theory and practice of instrumental quality control of construction work (window installation, installation of facade insulation systems).	U3	Teachers will be able to explain the principles of thermography to students and demonstrate exercises using a thermal imager and thermogram analysis.	
		• Fundamentals of Thermography • Knowledge of data analysis methods and techniques • Ability to present energy audit results	• Skills for working with thermal imaging camera settings • Thermal imaging survey - detection of thermal failures in buildings • Skills in analyzing thermograms in software

Monitoring of microclimate parameters	Unit	Competence	
		Knowledge	Skills
Focuses on the principles of monitoring microclimate parameters, explaining their role in creating comfortable indoor conditions. Teachers will gain an understanding of how microclimate parameters affect the health of occupants, learn how to monitor these parameters, and develop strategies for managing the life cycle of a healthy building. Demonstrations of common microclimate parameter tools and interfaces will be included.	U4	Teachers will know how to use microclimate control tools in classroom lessons and analyze them together with students while performing practical tasks.	
		• Basic knowledge of microclimate parameters (air temperature, humidity, CO2 emissions, lighting, noise) • Standard and optimal values of microclimate parameters • Knowledge of data analysis methods and techniques • Knowledge of digital data analysis tools	• Practical skills in working with instruments for measuring and monitoring microclimate parameters • Identify deviations, assess completeness and reliability, draw conclusions about data quality • Assess factors that may affect the reliability of results and conclusions regarding compliance with applicable standards

Energy balance of the building	Unit	Competence	
		Knowledge	Skills
The module explores the concept of a building as a single energy system. Teachers will learn about the	U5	Teachers will be able to perform a qualitative analysis of the energy efficiency of buildings during educational activities.	

principles of energy balance in buildings and the analysis of energy efficiency indicators. The module includes simple classroom activities that demonstrate energy conservation and energy efficiency thinking.		• Basic knowledge of heating engineering, thermophysics, electrical engineering, thermodynamics • Knowledge of methods for calculating a building's energy demand and energy consumption • Calculation method for determining the energy efficiency class of buildings	• Determine appropriate calculations and modeling tools • Determine the heat transfer resistance of enclosing structures, heat losses, and heat gains of the energy audit object, and compile an energy balance • Evaluate the results of energy modeling, energy consumption, and energy efficiency levels

Energy-saving measures assessment	**Unit**	**Competence**	
		Knowledge	**Skills**
This module focuses on the development, assessment, and implementation of energy conservation and energy efficiency measures in buildings. Teachers will explore how to assess the economic and environmental impact of implementing energy conservation measures. Emphasis is placed on improving energy efficiency when rebuilding damaged buildings	U6	Teachers will know how to analyze the main measures for improving energy efficiency.	
		• Mathematical modeling, principles and methods of mathematical modeling of the life cycle of buildings • Discounting basics. Determining the time value of money	• Identify opportunities and perform economic assessments of improvements in the achieved/achievable energy efficiency of building envelopes and engineering systems at energy audit sites.

			• Identify opportunities and conduct an economic assessment of the implementation of renewable energy sources at the energy audit site • Prepare recommendations for improving energy efficiency with justification of technical and economic feasibility